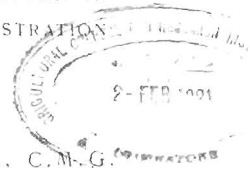
WAR AGAINST TROPICAL DISEASE

BEING SEVEN SANITARY SERMONS
ADDRESSED TO ALL INTERESTED IN
TROPICAL HYGIENE AND ADMINISTRATION



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CONTENTS

PAGE

LIST OF ILLUSTRATIONS

PREFATORY NOTE

The Wellcome Bureau of Scientific Research was founded towards the close of 1913 by Mr. HENRY S. WELLCOME, and is intended to advance the cause of Science in various directions.

It consists of a Central Bureau, chiefly concerned with research work in connection with Tropical Medicine and Hygiene, and in association with which a **Museum of Tropical Medicine and Hygiene** has been started, illustrating in a graphic manner both these important subjects.

This Bureau exists not only for purposes of research, but also for the purpose of supplying information gratis to medical men, sanitary administrators and others interested in Tropical Medicine and Hygiene, and it is hoped that those who may be assisted, and others who have it in their power to do so, will send specimens and photographs of clinical, pathological and sanitary interest for exhibit in the Museum. Arrangements will also be made for the prosecution of research in tropical countries. It was in this connection that the journey which is described under the heading "Tropical Problems in the New World" was undertaken.

In addition to the **Tropical and General Medical Research Laboratories**, which are affiliated to the Bureau for the purpose of carrying out research in bacteriology, parasitology and sanitation, there are other affiliated Institutions.

The Physiological Research Laboratories were founded in 1894, and their activities cover a wide field of therapeutic investigation, being devoted to serological, bacteriological and pharmacological inquiries. As they are concerned with the production of preventive and curative sera and of bacterial preparations for therapeutic inoculation, they conduct researches into the mechanism of immunity and in bacteriology. Associated with the pharmacological work, there has been research on the purely physiological problems which it suggests and involves. Methods have been originated and developed for controlling and standardising, by physiological experiment, the activity of those potent drugs to which chemical methods of assay are not applicable. The results of these researches have appeared from time to time in various scientific periodicals and transactions.

The Chemical Research Laboratories, established in 1896, are devoted to a wide range of researches in various departments of organic and inorganic chemistry. Their investigations have been of the most varied character, both in pure and applied

chemistry, the latter necessitating the examination of natural and synthetic materials, including native drugs and poisonous plants, likely to be of value in the treatment of disease. The detailed results of these investigations have also, for the most part, been published in different scientific journals and transactions.

An extensive **Historical Medical Museum**, illustrating the History of *Medicine and the Allied Sciences from the earliest times*, is also affiliated to the Bureau, and includes a department dealing with primitive medicine, surgery and the healing arts amongst semi-civilised and savage peoples. This section of the Museum is of special interest to medical men abroad.

The Bureau is not in the ordinary sense of the term a teaching establishment, though its Museums naturally possess an educational value.

Its development suffered owing to the war, as its resources were placed wholly at the disposal of the War Office at the outbreak of hostilities, and the members of its scientific staff were employed on army work, for the most part in tropical and sub-tropical areas.

During the period of the war a monograph on "Human Intestinal Protozoa in the Near East," by Lieut.-Colonel C. M. WENYON, C.M.G., R.A.M.C., and Captain F. W. O'CONNOR, R.A.M.C., was issued by the Bureau, the first large publication it has undertaken. It is hoped from time to time to produce records of its work in suitable form. The present volume is of an introductory nature, and is intended to emphasise the importance of Tropical Hygiene and to bring home its lessons both to medical and lay readers.

INTRODUCTION

THE seven papers comprised in this book have been termed sermons, for they are intended to spread that gospel of hygiene which is so important both at home and abroad. They have all previously appeared, save that on "The Palm from a Sanitary Standpoint," which is a new paper written specially for this volume. The others have been revised, slightly altered and, where necessary, brought up to date by the addition of footnotes.

"Some Aspects of Tropical Sanitation" appeared in Vol. A of the Fourth Report of the Wellcome Tropical Research Laboratories, and I am indebted to the Director of Education, Sudan Government, for kind permission to reproduce it here.

A similar indebtedness has been incurred towards the Society of Tropical Medicine and Hygiene, which has sanctioned the re-issue of the two articles entitled respectively "Tropical Problems in the New World" and "Sanitary and Insanitary Makeshifts in the Eastern War Areas." These were published in the Transactions of the Society, which, for purposes of illustration, has been good enough to permit the use of certain blocks in its possession.

To Dr STEPHEN PAGET, the Honorary Secretary of the Research Defence Society, I am greatly obliged for permission to make use of the paper, "Preventive Inoculation against Typhoid and Cholera," read before that Society; and it should be stated that the Chadwick Lectures on "The Problem of Hygiene in Egypt" appeared in the *Lancet*. The Editor of that journal kindly agreed to their inclusion in this volume.

Mr. JOHN LANGLEY, C.B.E., Under-Secretary of State for Agriculture, Egyptian Government, allowed me to have drawings prepared from the interesting communication on "The Date Palm in Egypt," contributed by Mr. T. W. BROWN, F.L.S., to the *Agricultural Journal of Egypt*.

Dr. CHARLES TODD, O.B.E., Director of the Institute of Hygiene, Public Health Department, Egypt, has been good enough to permit me to make use of interesting photographs supplied by him in connection with the Chadwick Lectures.

The Director of the Natural History Museum, South Kensington, sanctioned the photographic reproduction of some of the pictures of palm trees exhibited in that Museum. In a few instances the photographs taken there have served as studies for the artist of the Bureau.

Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., Director of the Royal Botanic Gardens, Kew, kindly granted me permission to have some of the drawings of palms in the Herbarium at Kew Gardens copied; and I am indebted to Mr. C. H. WRIGHT, of the Herbarium, for his courtesy and advice in the selection of these drawings and for the aid he rendered the artist.

I wish especially to thank Sir DAVID PRAIN, Dr. DAYDON JACKSON, of the Linnean Society; Mr. GERALD DUDGEON, C.B.E., late Consulting Agriculturist to the Ministry of Agriculture, Egypt; Sir I. B. BALFOUR, K.B.E., F.R.S., of Edinburgh University; Dr. T. H. HENRY, Director, Wellcome Chemical Research Laboratories; Dr. W. MANSFIELD-ADERS and Dr. A. H. SPURRIER, C.M.G., O.B.E., of Zanzibar, for much kind help and information on the subject of palms. To Dr. P. MANSON-BAHR, D.S.O., I owe the interesting photograph (*see* Fig. 101, *page* 200) showing the preparation of cloth from palm fibre.

Lieut.-Colonel G. E. F. STAMMERS, O.B.E., has rendered great assistance in the preparation of the book for the Press, and in the correction of proofs; while my sincere thanks are due to Mr. E. SCHWARZ-LENOUR, Artist to the Wellcome Bureau of Scientific Research, for the care and trouble he has taken in preparing many of the illustrations; also to Miss SUSAN SMITH, Librarian to the Bureau, and to Mr. H. K. M. TROY, its Secretary, for the manner in which they have rendered material aid in connection with reference work and the preparation of the MS.

A. B.

March, 1920

SOME ASPECTS OF TROPICAL SANITATION

WHEN your PRESIDENT did me the honour of asking me to deliver an address before this influential Association,[1] he suggested that it should deal with the subject of Tropical Sanitation. While I hastened to assure him that my time and energy were both very much at your service, I took exception to the title, and for two reasons. In the first place, it would have been presumptuous on my part to deal with Tropical Sanitation as a whole. While I have seen something of hygienic questions in the West Indies, in a sub-tropical portion of South Africa, and in certain regions of Equatoria, my experience has, in the main, been confined to those tawny wastes in which, like a phœnix from the ashes, has arisen that new city of Khartoum, which, from the attention paid to it by tourists and influential persons during the brief winter season, has been somewhat inaptly termed "the new hub of the universe."

In the second place, while only thirty years ago the time at my disposal would have been more than ample to discuss every aspect of the question, nowadays one cannot possibly do more than touch upon the fringes of a subject which has assumed, thanks to the work of MANSON, ROSS, BRUCE, LAVERAN, SIMPSON, FINLAY, GORGAS and others too numerous to mention, amazing proportions, an abiding interest, and an importance which it is wellnigh impossible to overrate. I therefore begged Sir JAMES CRICHTON-BROWNE that he would permit me to modify the title and term the address "Some Aspects of Tropical Sanitation," and with his usual courtesy he kindly assented.

I might almost have chosen as the title, "One Aspect of Tropical Sanitation," for it seems to me that a gathering like that before me would be more interested in the aspect or point of view of the Sanitary Inspector.

Now, Gentlemen, I am not a Sanitary Inspector, but I have had to perform, none too efficiently perhaps, the duties of this onerous office, so I can speak with some experience on, and I may even say somewhat feelingly of, the subject. I have at the outset a proposition to enunciate, a creed to declare, and in doing so, I speak no longer from the standpoint of the Inspector but from that of the Medical Officer of Health.

It is this that just as the non-commissioned officer is the backbone of the British Army, so should the well-trained, certificated, sensible, honest and energetic British Sanitary Inspector be the backbone of sanitation in our tropical colonies and dependencies. Personally, I believe that certain failures in anti-malarial measures have been due to his absence. I am certain that an intermediary of his type is required between the principal Health Officer and the subordinates, usually natives, who carry out the tasks which in

[1] The Sanitary Inspectors' Association

this country would fall to the lot of white men. I have tried untrained men, I have tried what here you would call foreigners—both the Greek and the Italian—and I have found them unsatisfactory in this class of work. Despite the expense involved, I advocated the employment of trained British Inspectors, and have, on the whole, had no reason to regret the choice. Everything depends, of course, on the type of man. All are not good, all are not suitable for work in the Tropics, all cannot stand the strain, the disappointments, the necessity for constant alertness, the little worries, for in the Tropics the mole-hill, with marvellous celerity, becomes the mountain. If you want to know the kind of man we need, read Sir HAVELOCK CHARLES's brilliant paper to the Tropical Medicine Section at the recent meeting of the British Medical Association. You will say, as I did: "Surely he describes the Admirable Crichton of antiquity; can this paragon be found?" And you will reply, as I did: "Yes, for the old country, even in these so-called degenerate days, still breeds this type of man" a fortunate thing for the British Empire and for the advance of that sanitary science which, in the Tropics at least, signifies so much in the way of health, energy and material prosperity.

British Inspectors

In Khartoum we now have four British Inspectors, while I understand that similar appointments have been made in India, that home of tropical hygiene, and elsewhere. I sincerely hope the practice will become universal and that those responsible for framing your curriculum and arranging your examinations will afford facilities for the study of tropical hygiene and set questions—and not too easy questions—for the benefit of those who are willing to profess this branch of knowledge. Furthermore, such men must be well paid. Their posts must be made attractive, they should be pensionable, they ought to get good leave periods, and, if thought desirable, study-leave when that is feasible.[1] Nothing is more progressive than sanitary science, and an inspector who has got a grasp of local conditions and feels himself competent to cope with local problems must not rest on his oars. If he is wise he will remember that his dry system of conservancy will pass away, that his rough-and-ready water supply will disappear, that his rubbish heaps or home-made incinerators will give place to destructors, that it is essential for him not to forget his knowledge of pipes and taps and water meters and steam blasts and the uses of clinker, but to cherish the memory of these things and to keep himself abreast of all modern views and of all recent advancements. Science is at all times a hard mistress, and sanitary science is especially woman-like in being so exceedingly changeable. You laugh, Gentlemen, but remember, it is all the better for it. In Scotland, we have an old saying that changes are *lichtsome*. I confess that sanitary changes are sometimes, fearsome as well. To return to our Inspector. Let us suppose we have secured him, even made him sign an agreement, and landed him on the spot—which are his friends and which his enemies?

Need for up-to-date knowledge

So far as the Sudan is concerned, his chief ally is the sun. It was JENNINGS who, in speaking of the sun in Abyssinia, stated that its power was such that it could wellnigh convert the smell of a pole-cat into the odour of a nosegay. There is here no doubt a little poetic licence, but much that is very true. For instance, it has been definitely

[1] More posts have now been created, and an excellent manual, entitled "Practical Tropical Sanitation," has been written by MUIRHEAD, but facilities for instruction in this country are not yet forthcoming.

proved that in India the typhoid bacillus survives exposure to the sun for a much shorter period than is the case under the same conditions in England. Doubtless, its death is as much due to that desiccation, which is so fatal to nearly all the pathogenic bacteria, as to the direct lethal action of the sun's rays and of the sunlight. At the same time, too much reliance must not be placed on the sun as an ally, for HARRISON has reported the recovery of typhoid bacilli from Indian dust after 77½ hours, during 23 hours of which the dust had been exposed to the direct rays of the Indian sun at Kasauli in the Punjab, where I believe the conditions do not greatly differ from those obtaining in Khartoum. It is perhaps more as a deodorising agent that the sun befriends the Sanitary Inspector. Deposits of excreta rapidly dry up and become inoffensive, though, as SMITH has shown, in Benares, and as we have also found in Khartoum, such deposits may yet serve as breeding-places for the house fly, and not only the excretal masses themselves, but the soil under them to a depth of several inches. Though the sun may thus fail to prevent the house fly breeding out, he does his kindly work later—kindly, that is, towards our Sanitary Inspector, but not towards *Musca domestica*, which he slays in large numbers in April and May. I have noticed frequently how rapidly the number of house flies diminishes once the sun attains his summer power. Sunlight, however, is not only operative on soil and soil conditions; it affects, in a very marked manner, the bacterial content of superficial waters, and, as you may know, CLEMESHA, in India, has proposed to employ the effects of sunlight on water bacteria as a means of arriving at a suitable bacteriological standard for such waters in tropical countries. It is a fortunate thing that the bacteria with the most evil significance from a hygienic standpoint appear to be those most susceptible to the action of sunlight.

The Inspector's friends

The sun an ally

We must, however, remember that there is a great difference between the action of the sun under moist conditions and its effects when the climate is dry. It is only in the latter state that the sun is able to exercise its full beneficial effects, and one of the first things a Sanitary Inspector has to recognise in a country like the Sudan is the difference between the dry and the rainy seasons. It is true that the rainy season in Khartoum is, as a rule, trivial, but every now and then the rains become for a time torrential, and, with a soaked, though rapidly drying, soil, a humid atmosphere and a considerable temperature, bacterial activity is stimulated; and it is well if, at the same time, the activity of the Sanitary Inspector increases to keep pace with, and eventually surpass, that of such pathogenic organisms as the *Bacillus typhosus* and the *Bacillus dysenteriæ*.

Influence of humidity

The sun, then, on the whole, is a good friend. Sad to relate, he must also be classed amongst the enemies, for his effects on the Sanitary Inspector himself are not always beneficial. What tropical resident has not, at times, dreaded the molten mass mounting rapidly to his zenith, and has not breathed a sigh of relief when old Sol, for one night only, has taken his last peep over the edge of the world? During the long summer, from April to November, the conditions, save during July and August, are undoubtedly trying. The sun's heat is exhausting, the sunlight is apt to play havoc with the nervous system, there is the risk, a slight one under dry conditions, of sunstroke and of sun headache. One has to spur oneself to exertion, and the best of men is apt to flag. The sun becomes a foe, but he may aid the Medical Officer of Health at such times by enabling him to weed out the fit from the unfit, by acting as a test of efficiency and devotion. Next to

Native populations and their attitude to the Inspector

the sun, dryness and lack of rain, as already indicated, are good allies. In the Sudan the character of the population is also a favouring factor. The people, if treated with tact and discretion, and if their few religious and racial prejudices are respected, are easy to manage. There is no enmity towards the Sanitary Inspector. He is known as a benefactor, and it is rare to find squabbles and disputes arising. We cannot practise the militant hygiene of Panama, and there is, as a rule, no need for stringent measures. In part this is due to apathy, in part to the habit of obedience inculcated in those living under British rule, and in part to an intelligent understanding and a desire to co-operate in work which is for the public weal.

Above all things, we have no cultured fanatics. The anti-vaccinationist has not yet raised his voice in the desert. The native is intelligent, and readily appreciates the value of JENNER's great discovery, for to him for many years smallpox was a dread calamity, while now it is becoming well-nigh as extinct as the dodo, or at least as rare as the whale-headed stork of our southern swamps.

Still, the apathy already mentioned leads me to class the character of the population also under the foes of the Inspector. His chief difficulty is with the Egyptians and with low-class Greeks and Italians, for the Arab and the black Sudani are cleanly races, and a Sudanese location is usually a model of cleanliness if not of comfort. The habits of bribery and corruption, so prevalent throughout the East, must also not be forgotten in the list of foes.

Last amongst the Inspector's friends I hope I may place the Medical Officer of Health. He must train and aid the Inspector. He must look well after his interests, he must not press him too hard, and he must seek to reward good and faithful service. He must also be prepared to back him to the uttermost, so long as he is confident that the Inspector is in the right and is acting with due courtesy in any contest which may arise.

The Inspector's enemies

As regards enemies, besides those already noted, we may mention the prevalence of insect life, but this leads us to speak at once of the communicable diseases, which it is the Inspector's main duty to prevent, to keep in check, and to abolish.

Malaria

First and foremost stands malaria. An Inspector has scarcely settled down before he is haled to the Wellcome Tropical Research Laboratories and instructed in the mysteries of mosquito life and propagation. The instructions need not be very extended or very minute. Three species of mosquito alone concern him closely—the malaria-carrying *Pyrcophorus costalis*, the ubiquitous and well-haunting *Culex fatigans*, and the dweller on board steamers and boats, the breeder in "zeers" and domestic utensils, the black-and-white, vicious tiger mosquito, *Stegomyia fasciata*, which, in the New World, has gained so unenviable a notoriety as the carrier of the virus of yellow fever. The Inspector must speedily familiarise himself with the water stages of these three insects. He must know, above all things, their respective larvæ, and should be able at once to "spot" their respective eggs and pupæ. He must know their habits and their distribution in the town. He must learn how to combat them, and he must never weary in well-doing.

We learn by our failures, and I can, perhaps, best illustrate this most important work by a few tales regarding it. Those who desire further information regarding the

W. Peal.

FIG. 1.—POOLS LEFT BY THE FALLING BLUE NILE, OPPOSITE THE EASTERN SECTION OF KHARTOUM

The presence of fish in these pools, as a rule, prevented mosquitoes breeding out in them

W. Peal.

FIG. 2.—POOLS LEFT BY THE FALLING *BLUE NILE*, IN SANDBANK, EAST OF BRITISH BARRACKS, KHARTOUM

Anophelines bred out in some of these pools which did not contain fish

campaign in Khartoum and its results may consult our Laboratory Reports and the chapter in *The Prevention of Malaria*, by Professor RONALD ROSS.

As the Blue Nile falls, pools are left in its sandbanks (*see* Figs. 1 and 2, *page* 21), and in these pools Anopheline larvæ speedily make their appearance, the mosquitoes invading the precincts of the town from outside, or being conveyed into it by steamers or boats. Now, just above the British Barracks, extensive sandbanks formed, pools were left, and in these pools Anopheline larvæ were found. The pools were treated, but whenever fresh ones formed they became infected. It was evident that *Pyrethophorus costalis* was in the neighbourhood, though not a single adult mosquito could be found. The British soldiers were in the habit of wandering along the river bank near these pools. They belonged to a regiment which had suffered from malaria elsewhere. The weather was cold. What happened? An old case relapsed, and immediately several cases of primary infection occurred—nine in all, I think, but, fortunately, not of a severe type. I could not find out whence the Anophelines were coming. On the other side of the river from these pools there existed an area of irrigated land, a thorn in the flesh, but it was always closely watched, and I was assured by the man in charge that all was well there. Such inspections as I made confirmed his statement. I was forced to believe the mosquitoes were breeding out in pools higher up the river, which, owing to their distance from the town, could not be controlled. Suddenly, however, the Sanitary Inspector himself, who lived near the farm, fell ill. I found he had malaria of the same type as that in the British soldiers. A very thorough search all over the irrigated area was at once instituted, and Anophelines were found breeding in several channels and in pools amongst the standing crops. The Inspector had relied on the native Inspector, and I had relied too implicitly on the Inspector, and meanwhile the north wind was blowing Anophelines half-a-mile and more across the river, with the results stated.

A story with a moral

The moment things were put right at the farm the infection of the pools ceased, and no more malaria troubled the troops. The motto of the British Inspector must ever be: "*Do not put too much trust in the native Inspector, however efficient he may usually be.*"

In this instance the Medical Officer of Health caught out the Sanitary Inspector, so it is only fair to present the reverse side of the case.

One morning a female Stegomyia had the impertinence to bite me on the hand in my office at the Gordon College. Next day the insult was repeated. I was much surprised, for we are far from the dockyard, which is, as a rule, the only place where these mosquitoes are now to be found, and there only very occasionally.

Sending at once for an Inspector, I asked him to make a careful search in the grounds of the building. He did so, and reported that he had found nothing. He then expressed a wish to inspect the laboratories. I said, "By all means; but you'll find nothing there." I followed him into our bacteriological room, and, with unerring instinct, he made for a "burma," or red earthenware vessel upon a stand. "Oh," I remarked, "you need not trouble to look there; it's always empty."

The Inspector's revenge

"Not of mosquitoes, doctor," was his reply; and, then, Gentlemen, the murder was out. There were soda-water bottles lying in water to keep them cool in that "burma," and the water had not been changed for days, and was swarming with a lively brood of Stegomyia "wrigglers" and nymphs, while new-born "imagines" were clinging to its

sides prior to their first flight upon the blood quest. The culprit was a clerk who, against orders, had adopted this method of storing his drinks and had taken no precaution against mosquito invasion. I fined him, but I had also to fine myself, for I was primarily responsible, and I do not doubt but that in the Inspector's mess there was much joy over my delinquency.

The Inspector has to be very wide awake, for mosquitoes sometimes breed in queer places. I remember a high official complaining to me that he was having a bad time with Stegomyia. Mosquitoes of this genus had recently been brought into Khartoum in large numbers by the river steamers, and had, I am inclined to think, been the cause of a small epidemic of horse-sickness.[1] This, however, by the way. As no breeding-places could be discovered, I was nearly driven to the conclusion that these mosquitoes were survivors of the invasion, for, as you probably know, *Stegomyia fasciata* is a long-lived insect. However, I fortunately asked the Inspector, a temporary, inexperienced man, if he had examined the rooms as well as the verandah. He had not done so, and further search revealed the presence of larvæ in the water contained in small tin receptacles in which the legs of the ice-chest stood as a protection against the thieving propensities of ants. Recently I found a similar state of matters in the Mess at Wau, in the Bahr-El-Ghazal Province.

An unexpected breeding-place for mosquitoes

One more illustration and I have done. A certain Company took up the question of converting the "Sudd," that matted growth of papyrus, vossia grass, reeds and rushes, into fuel, and sent a steamer and old ferry-boat south to experiment. One morning our Inspector at Khartoum North rang me up in alarm and wellnigh in despair. The ferry-boat had returned full of "Sudd," and full also of mosquitoes, which were flying ashore in a black cloud, seeking whom they might devour. Prompt action was necessary. The Inspector was ordered to engage special men on the spot, take the laboratory steamer, and tow the offending craft down the Nile to the lonely and sandy Tuti Island, where the cargo was to be discharged and the holds oiled. It was a cheerful task. The ferry-boat had no helm, and she and the steamer went waltzing down stream, while the unfortunate experimenter tore his hair in despair, and eventually invaded my sanctum to find out how he really stood, and to learn the enormity of his methods. I must say he was most reasonable. We were able to meet him half-way, and the threatened invasion was averted; but these episodes will show you how varied are the duties of our Inspectors when on mosquito prevention work. As regards other diseases, I need say little. I have mentioned smallpox. One has always to be on the watch that, during chicken-pox epidemics, smallpox cases may not occur and be missed. Chicken-pox, as in India, tends to occur in April and to be a disease of adults—a point of considerable importance.

Smallpox cases may be overlooked in chicken-pox epidemics

As you know, in unvaccinated communities smallpox reverts to its old type and becomes a disease of infants and of children—one sure proof of the preventive action of vaccination. Happily the native is now well protected and smallpox is rare, but it may be introduced, and then measures must be taken similar to those employed elsewhere. I recall a romantic incident in connection with a case which will give you an insight into another aspect of the Inspector's life. If you will you may call it the temptation aspect.

[1] This is an interesting question, which has not been settled; but there is some evidence to show that winged insects are the vectors of the virus of horse-sickness.

A case of smallpox had occurred in the town, and on inquiry it was found that the infected house had been visited by someone from another dwelling. It was necessary *to inspect the inhabitants of the latter. I did so in person, accompanied by the* "Mamur," as the Sub-Governor is called. The door was opened to us by an old, wrinkled and blear-eyed crone, who, on hearing our mission, forbade us entrance. "The master of the house is absent," she said, "and you must not intrude." It was explained to her that all that was required was to feel the pulses and look at the tongues of the inmates, but the duenna was obdurate in the extreme! Arguments, promises and entreaties all proving useless, the Mamur took matters into his own hands and entered the outer hoosh or yard. A wooden door guarded the inner yard—a holy of holies. Despite the ancient hag, this was at last pushed slightly ajar, and first of all an aged, white-haired man presented himself, held out a skinny wrist and protruded a tremulous but otherwise normal tongue. Then, after further delay, there appeared a dainty little figure clad in black, with eloquent and, I am inclined to think, interested black eyes, looking out over the "yasmak," or married woman's veil. The situation was carefully explained to this pearl of great price, and a dainty wrist was forthcoming and then the folds of the silken veil were drawn slightly, very slightly, aside, and a tiny pink tongue appeared, undeniably shapely, undeniably healthy. Satisfied, I beat a retreat, still regarded with suspicion by the she-dragon. Now, while a staid and married Medical Officer of Health may face such a situation with impunity, I ask you how it might have affected a young and susceptible Sanitary Inspector? Truly he has sometimes need of the discretion of a grey-beard.

Other diseases

The other diseases need scarcely detain us. Cerebro-spinal fever, when it occurs, is dealt with as at home, but it is often possible to destroy huts and fomites by fire. It is conceivable that Phlebotomus fever, due to the so-called sand fly, exists in Khartoum as in Malta, Austria-Hungary and elsewhere.[1] The vector is really a moth fly or so-called owl midge, a dipteron belonging to the "Psychodidæ," hairy as Esau, and exceedingly vicious. We have two known species in Khartoum, and, so far, their breeding-places have defied discovery, though our entomologist, Mr. King, has suggested *they may lay their eggs in the crevices in the sides of wells.*[2] *If this be so we may yet* behold our Inspectors hanging, like Mahomet's coffin, between earth and heaven, and diligently engaged in destroying the noxious broods. It would indeed be a great matter if we could prevent the multiplication of these annoying pests, quite apart from the question of any virus they may convey.

Measles is rare but always troublesome. In my experience it is not so dangerous as in this country, chiefly because the climatic conditions do not favour pulmonary complications. It keeps the Inspector, however, on the alert, as, with early notification, *Diphtheria* it is sometimes possible to check its spread. Diphtheria is likewise uncommon, but is of great interest to the bacteriologist, because I am inclined to think that a coccal form of the *Bacillus diphtheriæ* exists in the Northern Sudan. I cannot enter into this question here. The disease tries the Inspector's patience sorely, owing to the habit, common to Syrians, Egyptians, Levantines, Arabs and Sudanese, of relatives flocking to see a

[1] Phlebotomus fever is now known to occur in the Northern Sudan.
[2] Their larvæ have been found in cracks in cotton soil.

sick child The number of "contacts" is sometimes very great, and it is most difficult to ferret them out. No one responsible for the public health feels happy while diphtheria is in our midst. Its insidiousness is only equalled by its virulence, though, fortunately, antitoxin has abolished half its terrors.[1]

Enteric fever and dysentery lead me to speak at once of conservancy methods, and here it is that the Inspector finds the most scope for his energies. In the Tropics, as elsewhere, a water-carriage system of sewage disposal is undoubtedly the best, but such a system is expensive and requires an abundant water supply, while very often there are special engineering difficulties to be overcome. In the old days, Khartoum was served by the Crowley cart, or so-called "iron-clad." An "insanitary juggernaut" it has been named, and well-named, what with its foul sides, its splashing contents, its ever-leaking lid, its cohort of filthy flies, and its uncertain balance (*see* Fig. 5, *page* 27). Conservancy methods

FIG. 3.—SANITARY PAILS, KHARTOUM

On the left, the old type, now abandoned
In the centre and on the right, the new type, with air-tight cover

It was decided to abolish it, and introduce a bucket system on an approved principle—the buckets having air-tight lids. An apparently satisfactory bucket was found, tested and adopted. When used it is removed and a clean pail placed in its stead. The removal is a daily, or rather a nightly one, and double removal in the twenty-four hours is required in the case of latrines, hospitals and some other institutions. The covered pails (*see* Fig. 3, *above*; *also* Fig. 6, *page* 27) are removed in carts drawn by camels to certain collecting stations, where mule-drawn trollies await them on the conservancy tramways and they are conveyed to the trenching ground (*see* Fig. 7, *page* 29). There they are emptied, well cleaned (*see* Fig. 4, *page* 26), and returned for use. A bucket system

I am not likely to forget the time when the change was made. Our cleaners are of the lowest class, often drunken, and always inclined to laziness. A change is usually

[1] Happily in the Sudan, as in India, the disease does not appear to spread to any great extent.

abhorrent to them, new ideas do not penetrate their skulls, they are in many ways like the beasts that perish. We have no special sweeper class as in India, we have to rely on the riff-raff, and they lead us now and then a pretty dance.

I had only one British Inspector at the time, and I advised him to "gang warily," to introduce the new system gradually; but he was ambitious and very keen on the work. He applied it to the whole town straight away. It was surprising how the cleaners took to it. They preferred its comparative cleanliness, but for a time chaos reigned. I was forced to become an Inspector also, to rise at 3 a.m.—and in the winter it is often bitterly cold at that hour—to pursue defaulters whom I found emptying one bucket into another and thereby nullifying all the good of the system, to rush from quarter to quarter, to storm and rave, and sometimes to stand aghast at the pile of pails which had

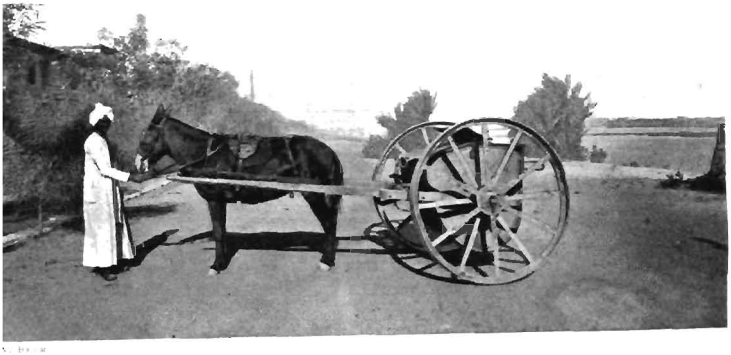
FIG. 4. BUCKET CLEANING AT SEWAGE FARM

A crisis

accumulated owing to some accident on the tram line. A crisis occurred. Owing to certain women street-sweepers getting a rise of pay while he did not, every conservancy cleaner struck work. Conservancy was at a standstill. The strike occurred at night. I had a vision of the morning, the empty latrines, the frantic populace. There was only one thing to do. I authorised the Inspector to promise every man a rise of pay, and then I went, hunted up the Financial Secretary, painted the situation in lurid colours, and obtained financial approval. The evil was averted, but the Inspector had to labour like Hercules to get things set agoing in time.

Reduction of dysentery

Such a system prevents the soil in the neighbourhood of houses becoming fouled, and, properly conducted, is very efficient. It has, in my opinion, led to a notable reduction of dysentery in Khartoum, while in a population of about sixty thousand we have only some fifteen cases of locally-acquired enteric fever a year. It is somewhat



W. BEAM

FIG. 5.—CROWLEY CART, NOW ABOLISHED

W. BEAM

FIG. 6.—CONSERVANCY CAMEL CART, KHARTOUM SANITARY SERVICE

expensive to work, and its success depends almost wholly on efficient inspection. We have a saying in Khartoum that when things are going very smoothly it is well to be suspicious. Rapid work usually means faulty work, for the cleaner is up to every kind of trick, and loves to lighten his load. He has to be taken unawares and promptly punished, but he must be justly punished, for the least injustice rankles, and may speedily bring about a rebellion. I cannot describe all the aspects of this work, but let us look for a moment at the method of disposal of the excreta.

Those of you who have read that masterly study of social life, *Les Miserables*, may remember the fine passage in which VICTOR HUGO deals with the sewage question :—

A quotation from Victor Hugo

"Paris," he says, "casts twenty-five millions of francs annually into the sea, and we assert this without any metaphor. How so and in what way? By day and night. For what object? For no object. With what thought? Without thinking. With what object? None. By means of what organs? Its intestines. What are its intestines? Its sewers; 25 millions is the most moderate of the approximate amounts given by the estimates of modern science. Science, after groping for a long time, knows now that the most fertilising and effective of manures is human manure. The Chinese, let us say it to our shame, knew this before we did; not a Chinese peasant—it is Eckeberg who states the fact—who goes to the city but brings at either end of his bamboo a bucketful of what we call filth. Thanks to this human manure, the soil in China is still as youthful as in the days of Abraham, and Chinese wheat yields just one hundred and twenty-fold the sowing. There is no guano comparable in fertility to the detritus of a capital, and a large city is the strongest of stercoraries. To employ the town in manuring the plain would be certain success, for if gold be dung, on the other hand our dung is gold. What is done with this golden dung? It is swept into the gulf. We send at great expense, fleets of ships to collect at the Southern Pole the guano of petrels and penguins, *and cast into the sea the incalculable element of wealth which we have under our hand.*

The value of sewage

All the human and animal manure which the world loses, if returned to land instead of being thrown into the sea, would suffice to nourish the world. Do you know what these piles of ordure are, collected at the corner of the streets, those carts of mud carried off at night from the streets, the frightful barrels of the night-man, and the fœtid streams of subterranean mud which the pavements conceal from you? All this is a flowering field, it is green grass, it is mint and thyme and sage, it is game, it is cattle, it is the satisfied lowing of heavy kine at night, it is perfumed hay, it is gilded wheat, it is bread on your table, it is warm blood in your veins, it is health, it is joy, it is life! So desires that mysterious creation which is transformation in earth and transfiguration in heaven—restore this to the great crucible and your abundance will issue from it, for the nutrition of the plains produces the nourishment of man. You are at liberty to lose the wealth and consider me ridiculous into the bargain—it would be the masterpiece of your *ignorance. Statistics have calculated that France alone pours every year into the* Atlantic a sum of half a milliard. Note this, with these 500 millions, a quarter of the expenses of the Budget would be paid."

Great words, Gentlemen! No doubt the poetic licence is again visible, but who will deny the main truth of the argument, albeit VICTOR HUGO ignores the effect of the sewage on fish life, a subject of special interest to us to-day. Furthermore, he does not mention

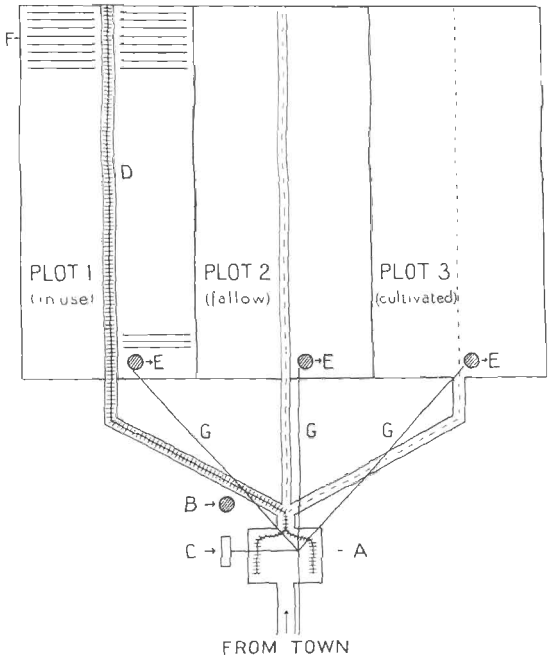


FIG. 7.—PLAN OF THE LAY-OUT OF A TRENCHING GROUND

A=Exchange station where receptacles in road lorries are transferred to tramway system
B=Shed for storage of tools, etc
C=Ablution arrangements for employees.
D=Movable tramway—(dotted lines show site when Plots 2 and 3 are in use).
E=Depots for washing receptacles prior to return to the town.
F=Trenches.
G=Water for washing receptacles and carts, and for ablution of employees.
(If a piped supply is not available, local wells may be employed.

the problems which await, the difficulties which beset, the scientist who would carry this dream *into practice*. *If these difficulties are great in Europe, they are much greater in* the Tropics, where money is not plentiful and trained engineers are few. In one respect, however, the Tropics often score. Land is usually plentiful and cheap. Hitherto, at Khartoum, we have had to be content with pitting our sewage in shallow trenches and leaving it to the action of those saprophytic organisms which speedily transform it from an abomination into a harmless product of bacterial activity. We have little rain, and hence cannot grow rain crops on the ground; and, in the Sudan, water spells money with a big "M." All the time, however, we have been experimenting on a small scale to see if a septic tank system can be applied to such a dry system of conservancy as is in vogue. It is far from being really dry. The population is in the main Mohammedan, and the Mohammedan, in this respect advanced beyond his western brother, employs lavage, so that the contents of our pails are for the most part semi-liquid. At the same time, it was found necessary to dilute the sewage to obtain anything like a good effect. Such dilute sewage was treated both in metal and in brick tanks, ærobically and anærobically, and certainly it is remarkable how quickly liquefaction occurs when the temperature is high. I cannot enter into details, but I recall an incident whereby an Inspector proved his worth. A tankful of diluted sewage had been left to work out its own salvation for 48 hours. It was far from savoury, but I wished to see and obtain samples of the effluent. The outlet valve was rusty, and in order to loosen it we had to employ a key and hammer. These instruments performed their duty with a vengeance, for suddenly the whole valve came away, and there was a rush of foul-smelling effluent of the colour, if not the consistence, of pea-soup. The Sudanese foreman fled. I confess I skipped out of the way with alacrity; only the Inspector stood firm. Knee-deep in the stream he searched for, found the valve, rammed it home, and stayed the flood.

Experiments in bacterial treatment of sewage

"Familiarity," you may say, "breedeth contempt." No doubt; but I said to myself, "This is the man for my money," and I have had no reason to alter my opinion.

We are now about to advance and make a serious effort to start a sewage farm, whereon we may grow fodder crops, such as gerawi grass and burseem. In a country where intestinal parasites are common, vegetables for human consumption should not be produced on sewage-treated soil.

Proposed sewage farm

Personally, I think, the scheme will prove successful, and, at any rate, it is in the right direction, while the fact that our trenching ground is limited, and is in danger of becoming sour, renders some such change imperative.[1]

One has outlined the conservancy method for the main town, but such a system cannot be applied to the long line of native villages south of the city where, tribe by tribe, live hundreds of native labourers and their families. Nor can it be applied to certain extensive native locations in Khartoum North. It is in such cases that the small incinerator (Fig. 8) proves itself of value. It is built of sun-dried brick, protected by a coating of what is termed "zibla"—a mixture of mud, straw and manure, which hardens and withstands rain—is cheap, easily constructed and easily worked. The man who

Incinerators

[1] The experiment met with some success, but, for several reasons, has been abandoned.

attends to the fire acts as sweeper over a certain area. The natives follow their usual custom of easing themselves in the open, and the scattered excreta are swept up daily, along with the general refuse of the villages, and burned to ashes, the latter being buried or employed in filling up inequalities in the ground.

This method, originally, I think, devised in India, is of great service, and, if properly carried out, is a decided improvement on the old Mosaic custom where (as we read in Deuteronomy):—

Mosaic injunction

"Thou shalt have a place also without the camp, whither thou shalt go forth abroad: and thou shalt have a paddle upon thy weapon; and it shall be, when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee"—a practice very excellent in itself, but impossible of realisation on a large scale in the case of settled communities such as those with which we have to deal.

FIG. 8.—SMALL INCINERATOR AT DAIM (VILLAGE)

The Birth-rate

You will see that in many ways our problems differ from those you have to face in England. To judge from current literature, one of the most serious of the latter is the progressive lowering of the birth-rate, while the whole question of child-life and early physical training is attracting earnest attention. As you are aware, your PRESIDENT is one of the leading authorities on these matters, and on the equally important question of the people's dietary.

In the ancient town of Haddington, many years ago, a worthy gentleman lost a maiden aunt to whom he had been sincerely attached. I do not know whether the lady left him a legacy, but certain it is that, he erected a tombstone to her pious

memory, and had graven on it a verse. You will agree with me that his qualities were more of the heart than of the head, for this is what he wrote :–

" Here lies Miss Gourlay, I shall not say what,
But all that a woman should be she was that."

It happened that the fine new tombstone caught the eye of the old parish minister as he was taking a daunder in the kirkyard. He read the epitaph, and shook his head : " Na, na, Miss Gourlay," he said, " this'll no dae." Taking a piece of chalk from his pocket, he wrote underneath :—

" A woman should be baith a wife and a mither,
Miss Gourlay was neither the t'ane nor the tither."

Now, I tell this little story to assure you that this wise old man would have been amply satisfied with the female population in the Sudan.

Fecundity of Sudanese

It is, I believe, the case, and a matter of interest to sociologists, that crude contraceptive measures are practised at times by the Sudanese, but such can play no great part in their social economy. One has only to look at the swarm of merry, black, pot-bellied children on the foreshore at Omdurman to realise that the Sudanese are obeying the old Scriptural injunction, " Be fruitful, and multiply, and replenish the earth." I cannot give you figures, but there can be no doubt the birth-rate is high, and the sight of all these cheery, fearless urchins in itself justifies, if any justification were needed, the Anglo-Egyptian occupation of the Sudan. Nowadays, these children can grow up with some hope for the future, and without the menace of the slave-raider, the sword, the rope, the famine and the pestilence, which in the days of the Khalifa wrought such dire havoc in the land.

The milk supply

It is this question of the children which brings me to another important factor in the *Inspector's life—namely, the control of the milk supply.* Most of the native infants are breast-fed, and, so far as Khartoum is concerned, the question chiefly affects the older children of the poor Greek and Italian communities. For those who can afford it, *excellent milk is available from the Government dairy farm, but its price is high, and most* of the milk is derived from native cows and goats. Which is the better, the milk of the cow or goat ? The latter animal possesses two great advantages : it very rarely suffers from tuberculosis, and it is cleanly in its person, thanks chiefly to the special form and consistence of its excreta. It is also said to be a clean feeder. I believe that is true of the goat in England, but it is certainly not the case as regards our little Sudanese goats. They love rubbish heaps, and I have seen them devouring dirty paper and fragments of women's cast-off clothing. Truth to tell, there is precious little for them to eat in the neighbourhood of Khartoum. Their means of sustenance is to me a mystery, and I am half inclined to think they enjoy chewing tin cans and the fragments of broken bottles. In the Sudan, where animal tuberculosis, unlike human tuberculosis, is very rare, and where cattle live in the open *I think cow's milk is preferable, but this is a matter of taste.* The milk from the native herds is very good. Analyses by our chemists show it to be well up to European standards, and to be specially rich in fat. It is not the milk which is at fault, but the milk vendor. Women bring this milk into the town very early in the morning from the outlying villages, and you will scarcely believe me when I say that some

Goat's milk

FIG. 9.—REFUSE TROLLEY AND INCINERATOR AT SEWAGE FARM

G. BUCHANAN

FIG. 10.—BUCKET REPAIRING

of these villages are nine miles away, so that the vendors have to tramp eighteen miles *in all, half the distance with their burden of milk, and all for a very meagre profit.* Needless to say, they endeavour to improve matters for themselves, though not for their customers. Their methods are not scientific. Any water will do, and any quantity of it so long as the milk retains a whitish colour. Moreover, they were in the habit of conveying the milk in earthenware vessels. Anything more fitted for bacterial growth and activity than one of these "burmas" it would be hard to conceive. They are porous, and usually filthy. A dirty bit of rag stuck in the mouth prevented milk being lost by splashing, and added to it all manner of abomination.

"Watering" the milk

At an early period steps were taken to regulate this traffic. The women were registered and given badges. "Burmas" were forbidden and proper cans substituted. Matters were carefully explained to the ladies, and then the fun began. The cheerful and exhilarating sight was frequently witnessed of the Medical Officer of Health and the Sanitary Inspector pursuing, on horseback, one of these dames who had reverted to her old methods—had a "burma" on her head, or had been filling her can from a convenient well. Punishment did good, and things improved—only to relapse. It was impossible to keep a very close eye on them all, and now another scheme is to be tried. It could not be carried into effect until the number of Inspectors was increased. As this has been done, the following measures will come into force shortly:—

Registration of milk vendors

The women, all registered, will bring in the milk in properly covered cans to a central station. There the milk will be measured, and samples taken for analysis from time to time. It will then be transferred to tins owned by the municipality, which will have locked covers, and from which milk can be obtained only through the exit taps. Customers will be notified of the change, and it will be their own fault if they do not see their milk supplied through these taps. Meanwhile, the women's tins will be scalded, cleaned and made ready for the evening, when they will be given back to the vendors on their return from their milk walks, while the empty municipal tins will be collected, cleaned and stored ready for the next morning. *The scheme sounds simple and effective. It remains to be seen how it will work.*[1] *I think if the women charge a little more for* such good milk there will be no hardship on either side—the public will no longer be cheated, and the risk of diarrhœa and marasmus will be lessened.

I have now dealt with the main features of the Inspector's life. He has many other *important duties. He has to supervise a railway gang who keep the tramway in order*; he is responsible for refuse destruction (*see* Fig. 9, *page* 33); he controls the mineral water factories: he keeps an eye on the markets (*see* Fig. 11, *page* 36), especially our primitive fish market, and the slaughter-houses. House-to-house inspection takes up much time, and is combined with the never-ending mosquito work. We have few noxious trades, but such as exist must be watched and regulated. Our Chief Inspector has established blacksmith's shops, where we repair our sanitary pails—quite a big business (*see* Fig. 10, *page* 33). An eye has to be kept on the conservancy animals, and attempts at the *pilfering of fodder checked. The clerical work is heavy, and statistics have to be prepared* for the annual sanitary budget. Prosecutions have to be attended and evidence given.

Miscellaneous duties

[1] Unfortunately, it was never possible to bring this scheme into full operation, but other arrangements have been made to secure a good milk supply for the European population.

Until recently the Sanitary Inspectors had to undertake the poisoning of stray dogs, for there is always a risk of hydrophobia. They have all manner of "orra jobs," and I assure you they earn their pay. Khartoum and Khartoum North cover a large area, and you will not be surprised to hear that our Inspectors are a mounted force. One insisted on their being supplied with horses or ponies. We only take men who can ride.

I remember saying to one of them on his arrival, "I understand you can ride?" "Well, Sir," he replied, "I won't say I'm a horseman, but I have been practising very diligently on an old cab-horse at home." I fear he found the fiery Syrian with which he was presented very different from his Scottish charger; but he soon became an expert, and could now make a jockey sing small.

Like a woman's, an Inspector's work is never done, but he has the satisfaction of seeing the good results of his labours. I have no wish to boast, and know that statistics have to be collected over a long period, but, so far as communicable diseases go, I doubt if a healthier city than Khartoum exists in Africa at the present moment. Something is due to its comparative isolation (another of the Inspector's friends which I omitted from the list), but more is due to the fact that the town was caught young, and early in its new career passed under what some might call a sanitary tyranny. Very different are the conditions from those which rendered the old Khartoum a pest spot, and led the wily Dervish to raze it to the ground and establish his capital at Omdurman. A very great deal is due to our Sanitary Inspectors. I sometimes think that when a Medical Officer of Health is complimented on the state of his district he would do well to recall what Lord Howe said to old George III. after the crowning victory of the glorious First of June. On his own quarter deck he received a jewelled sword and the congratulations of his Sovereign. The tears stood in the old Admiral's eyes as he turned and stretched an arm forward to where his sea-dogs were clustered: "It is not I, your Majesty," said he, "it is these gallant fellows." The new Khartoum

Tropical sanitation means war, a ceaseless war, an exhausting war—but, thank God! if properly waged, a successful war—against those conditions which tend to slay the white man and the black. It is RAY LANKESTER who has said that if we could only apply our present knowledge properly all communicable disease could be stamped out in the short course of fifty years. With certain reservations as regards some tropical disorders, I heartily concur in this optimistic view. What we require is education, such legislation as will crush the cultured but ignorant fanatic and aid the worker, a devotion to the cause, and a well-trained band of helpers. Sanitary warfare

Foremost amongst these stands the Sanitary Inspector, and thus it is that I trust we may soon see him in ever-increasing numbers taking up that white man's burden, which of all burdens is perhaps the noblest to bear.

Then, and then only, may we, in part at least, experience on earth a foretaste of that which we are promised hereafter: "There shall be no more death, neither sorrow, nor crying, neither shall there be any more pain: for the former things are passed away."

Fig. 11.—Exterior View of Portion of Meat Market, Khartoum

TROPICAL PROBLEMS IN THE NEW WORLD

To ANYONE gifted with what we may call the "sanitary eye" the most interesting notice on board a Royal Mail steamer bound for West Indian and South American ports is one which is to be observed in the closet compartments, and which is printed in *Spanish and in English*.

"Please do not throw paper on the floor," is the injunction.

To the uninitiated this suggests a laudable desire for tidiness. Its real significance is not apparent until one embarks upon a South American river steamer, or penetrates into Venezuela or Colombia; but of this anon.

BARBADOS

We will begin with Barbados, a tight and loyal little island, the outpost of our Empire in the West. There is nothing very tropical about Barbados, when viewed from a steamer in the Roads. Save for a fringe of Casuarina trees, resembling Parkinsonias, and an occasional palm, one might be gazing at a bit of southern England transported to the Caribbean Sea; but as soon as one nears the shore this illusion is dispelled, for the coral formation is apparent, together with other features inseparable from hot climates. Barbados

Still employing the "sanitary eye"—a very useful asset in such journeyings, and one, as a rule, more agreeable to use than the "sanitary nose"—we observe the large number of small craft, mostly schooners, tied up alongside the wharves and lying in the careenage. We enquire whence they come, and are told that they hail from the neighbouring islands, British Guiana and the Orinoco. At once we are confronted by an interesting problem. Locally-acquired malaria is unknown in Barbados, for the simple reason that anophelines are not present in the island. Why are they not in evidence? Granting *for the moment that there are no suitable breeding-places for them, or that natural* enemies abound and prevent them propagating themselves, how comes it that they are not introduced by these small craft, hailing from regions where they are common and very often infected with the malarial parasite? Absence *of malaria*

It is true that the anopheline is not nearly so good a traveller or seafarer as the hardy stegomyia, but still we know that he, or rather she, can be carried long distances

on steamers, as, for example, from Bombay to Trieste, and occasionally from the Southern Nile to the desert areas of the Sudan.

Mosquitoes and small craft

I questioned Dr. BRIDGER, the able and energetic Port Health Officer of Bridgetown, on this matter. He told me that he had searched the vessels for them, but had never been successful in finding them. In a letter which he sent me some time ago, he says:—

> "I have myself often wondered that mosquitoes do not find their way here on these craft; but have never yet discovered one, though I have looked for them both before and since you referred to the matter. We have about half-a-dozen white men—natives of Saba—who are masters, and usually owners, of these craft, and I have discussed with them this question. They tell me that lying alongside the wharves in British Guiana (Georgetown) mosquitoes come on board in large numbers—probably many anophelines among them, for malaria is quite common there—but on getting to sea they disappear entirely, as a result, in their opinion, of the strong breeze blowing them away. Barbados is to windward of all the neighbouring malarious ports, and therefore sailing vessels have to "beat," as it is called. Making these several tacks they would get swept by the wind first on one side and then on the other.
>
> "It is conceivable that every mosquito on deck or in the living compartments which are only deck-houses, could be swept away, as they are very fragile. As to those which may be concealed in the hold, we must conclude that the tight battening of the hatches, for not less than thirty-six hours, must be sufficient to kill them."

It may be so—it probably is so—but I would like to see a few ideal breeding-places artificially constructed in close proximity to the wharves. It would be very interesting to observe what such a kind of trapping produced. I suggested this manœuvre, but was told that it would immediately result in a campaign of calumny, and that any hapless medical man who tried it would run the risk of being accused of enticing deadly insects to the island!

Barbados is justly proud of a fine conservatism, but it may be, and is, carried too far in sanitary matters.

Let us go a step further in our malarial enquiries, and, at the same time, a step back. The first will bring us to a consideration of possible anopheline breeding-places in Barbados, the latter will refer us to the statements made by Dr. MALCOLM WATSON in this very room a twelve-month ago, and the remarks of Dr. LOW thereupon. Dr. WATSON declared that the absence of breeding-places was due to the porosity of the coral limestone of which Barbados is composed. Dr. LOW stated that such a conclusion was not justifiable, and cited the presence of permanent water collections near Worthing. That Dr. LOW was correct is apparent from the photographs I was able to take, showing the extensive Hastings swamp with its accompanying canals, and also certain pools which look ideal for anopheline breeding operations, a photograph of which is given here (Fig. 12). On at least one estate there is also a large pond which might very well play the part of

Causes of freedom from malaria

a mosquito nursery. Both Drs. WATSON and LOW agreed that the presence of the famous Barbados "millions" cannot be the sole cause of the absence of eggs, larvæ and pupæ, and Dr. LOW has shown that, so far as the Hastings swamp is concerned, there is nothing in the chemical constitution of the water adverse to mosquito life. I brought some of the "millions" home, and had them named at the British Museum (*see* Fig. 13, *page* 40). They are not *Girardinus poecilioides*, but *Lebistes reticulatus*—a point worth noting. Larvæ-eating fish

FIG. 12.—A POOL NEAR HASTINGS SWAMP BARBADOS

Are there any other enemies which may play a part? In the pond aforesaid there were ducks, and these might certainly be effective, while the swamp is actually maintained as a shooting ground. It attracts flocks of migrating birds, and these would probably play havoc with mosquito larvæ, but only at certain times of the year. In my search I came across another enemy, very abundant and very voracious, which seems to have been overlooked. This is the little back-swimmer, belonging to the genus *Notonecta* (*see* Fig. 66, *page* 91) which, by means of its active movements and its silvery belly, is easily recognised. It might well be named an aquaplane, for when speeding through the water it closely resembles an aeroplane upon the wing. WILLCOCKS, of Cairo, was the first Aquatic birds

Back-swimmers

to draw attention to the larvivorous habits of these useful insects. I tested them at Khartoum and was interested in coming across them again. The indefatigable Dr. HUTSON being with me, I pointed them out to him, and he told me that he had been puzzled by one water collection which contained no "millions"—only these *Notonectidæ* and, though in every other respect suitable for culex or stegomyia larvæ, was quite mosquito-free. He had suspected the back-swimmers, but was told they were inoperative. We soon found the contrary, and spent a profitable Sunday afternoon watching them fasten on culex and stegomyia larvæ, which they grip as a spaniel grips a rabbit, and then engulf, tail first. When you convey these back-swimmers from their native haunts in a vessel or jar, you have to be careful that the latter is covered, for these curious creatures have a habit of reaching the surface, rapidly drying their wings and flying forth. As I was journeying in the mule train from Hastings to Bridgetown, one of my specimens played me this trick. It is known that these *Notonectidæ* sally forth from their pools at night and seek fresh hunting grounds.

FIG. 13.—LEBISTES RETICULATUS "MILLIONS"

Now I am far from saying that the recognition of larvivorous *Notonectidæ* in Barbados solves the mosquito problem there, but they may certainly play a part in keeping pools and swampy areas free from larvæ. It would be well worth someone's time to investigate the question thoroughly.

Natural oil

Dr. SAMBON tells me that in the rugged northern part, known as Scotland, where, at certain seasons of the year, there are running streams, the presence of natural oil may be the reason for the absence not only of the water stages of the mosquito, but of all aquatic life in these temporary rivulets. I am unable to express an opinion on this view, as I only gazed upon St. Andrew's Parish from one of the highest elevations in the island. I got there through the kindness of Dr. HUTSON, who has done so much for the island from a sanitary standpoint, and who pursues the wily stegomyia with an ardour which deserves success. Is it not, however, a disgrace that in a little island like Barbados, where there are few natural breeding-places, stegomyia and culex still flourish exceedingly? Given full powers and adequate assistance, more especially in the direction of trained British Sanitary Inspectors of the right type, I believe that Dr. HUTSON, or any other energetic and tactful Health Officer, could clear Barbados of harmful mosquitoes within a year; that is to say, he could reduce them in numbers till they were no longer a potential or actual source of danger to the community.

On the contrary, what do we find? Despite the great advantages accruing from a pipe-borne water supply, despite Dr. LOW's and Professor BOYCE's campaigns, despite

tales of comparatively recent local outbreaks of yellow fever such as that in 1908,[1] despite the presence of the well-known Yellow Fever House, despite Dr. HUTSON'S work, stegomyia are still busy breeding in barrels, tanks and other convenient places provided by the negro small-holder, and too often also by the European. The inhabitants, if ever they think about the matter at all, rely on their Port Health Officer. They might do worse, but they might certainly do a great deal better, and meanwhile are contented to be pestered and bitten by a voracious blood-sucker. Mosquito pests

Conditions are even worse when we consider the culex mosquitoes. These abound in some parts and, sad to say, filariasis is far from uncommon, and so elephantiasis is to the fore. Indeed, Barbados is acquiring an evil reputation, and the phrase "Barbados leg" is coming into use. Is it fair or right that young and otherwise healthy people should be afflicted with an easily preventable disease like elephantiasis? Is there any rhyme or reason for tolerating a state of things where possibly, through no fault of their owners, a man's scrotum may eventually reach his knees, or a woman's graceful leg and foot attain huge and hideous proportions? In some countries the difficulties of getting rid of the mosquito carrier of filaria are wellnigh insuperable, but this is not the case in Barbados, and it is amazing at this time of day to see the lethargy and indifference with which the mosquito question is treated; and it is both amazing and disheartening to be told of the opposition which Dr. HUTSON'S diligent efforts encounter. Filariasis

There is only one way of dealing with this kind of thing, and that is what we may call the punitive method. Offenders must be fined—tactfully fined, but well fined—until they learn that it is better to keep an eye on their water receptacles than to be frequently called upon to pay a penalty. The system is in force in Barbados, but organisation is lacking. Full powers must be accorded the Health Officer, who should be well paid and devote all his time to sanitary work. He must be given a sufficient and efficient staff. It is absurd that a man of Dr. HUTSON'S years and standing should have to go wandering about amongst negro cabins, dipping cups and calabashes into barrels, and wearing himself out in duties which could be performed by a young and trained assistant, thus setting free his chief for grappling with some of the other problems which Barbados presents. Lack of organisation

There are many such. I might speak of the "Poor Whites," of whom we heard when our PRESIDENT[2] delivered his inaugural address, but I will keep them until we get to Grenada. The guinea-fowl in Africa is a pathological museum. The blood of those I examined in Barbados showed no hæmatozoa. Neither did the blood of some captive migratory birds; but, for all that, an interesting piece of work would be to determine the blood parasites of the wild and domesticated creatures of the island. It has never been done, but it should be done, and I think Dr. JOHNSON, Director of the Laboratory, is the man to do it. He is keen and has a very fair equipment, but he needs assistance and a larger annual contingent. At present he has too much other work to do. Still there is hope in that direction.

[1] It is possible, as GUITERAS has recently pointed out, that some of these may be examples of febrile jaundice.—*New Orleans Medical and Surgical Journal, December*, 1919.

[2] Sir HAVELOCK CHARLES, G.C.V.O., at this time President of the Society of Tropical Medicine and Hygiene.

Lepers

The Barbadian leper would form an interesting subject of study. Why did pigs, which were once kept at the leper asylum, develop a curious disease, associated with skin lesions, when fed, *horribile dictu*, on the old poultices and dressings? This economical practice is no longer in force, but it appears that an opportunity for research was lost. At the same time, the rats there are affected with what may be rat leprosy, so a part of the field is still open to the anxious enquirer! Is this so-called rat leprosy really a form of tuberculosis? What is the best way of dealing with crab-holes, the breeding-places of *Deinocerites*?

GRENADA

Dangers of yellow fever

However, I must not let Barbados detain us any longer, so we will away to a very different type of island, a veritable pearl of the Antilles, the green and picturesque Grenada. But though Grenada differs in many respects from Barbados, I regret to say that they have at least one thing in common, and that is the prevalence of *Ædes calopus*, as *Stegomyia fasciata* has been re-named by KNAB. St. George's is full of this annoying insect, and again we ask, why? If Barbados is somewhere about the base of the yellow fever volcano, St. George's is perilously near the brink of its crater, for it is more liable to be invaded by that disease. I was told that "a certain amount was being done." Any sanitarian knows what that means. It is a hygienic opiate which stills the conscience of officials and lulls the populace into a false sense of security. There is no use mincing words when dealing with these matters. Questions concerning life and health are, or should be, too important to be relegated to the domain of fair speech and suave excuses. The mailed fist and not the gloved hand is required when dealing with grave faults in tropical sanitation, but what with lethargy, inertia and vested interests, even the mailed fist finds it difficult to accomplish the work, and it must in any case be wielded with due tact and discretion. I speak feelingly, for I was devoured by stegomyia—the mosquito curtains being wrongly hung upon an old four-poster bed. My only satisfaction was that, like MOWGLI, I enjoyed much good hunting, aided by an electric torch.

"Poor Whites"

I received the same kind hospitality in Grenada as in Barbados, and hence was able to see some interesting cases. Amongst other places visited was the colony of "Poor Whites" at Mount Moritz. Canon WALTON, who takes a keen interest in these poor people, and is also alive to the claims of hygiene in the Tropics, accompanied me. These settlers—some 200 in number—came from Barbados forty years ago. I need not tell you who they were originally, or how they have kept to themselves. In Barbados I had seen some of the children lying ill with enteric in St. John's Parish. Beautiful children certain of them were, their fine features telling of good blood and an ancestry at one time of high degree. I found similar boys and girls in Grenada, for the most part sturdy, well-nourished, good-looking, though pale, and fairly alert (Fig. 14). But there were notable exceptions. Where the deadly ankylostome had fastened there was evidence of anæmia and degeneration. I show you a small boy with the typical facies (Fig. 15), the youthful victim of severe hookworm disease. It was the same tale throughout. So long as these children escape ankylostome and malaria infection, there is not much wrong

with them, and, both mentally and physically, they at least approach children of their age in temperate climates. It was another story with the adults. These unfortunate people—*some, remember, with traces of blue blood in their veins*—are termed "*Red Legs*," and are looked down upon by the prosperous negro. Amongst them I noticed only one who could be called a good type of manhood. He was rather a fine fellow, who had recently returned from Panama, and who, I think, would have compared favourably with the

The "Red Legs"

FIG. 14.—"POOR WHITE" CHILDREN, GRENADA

FIG. 15.—"POOR WHITE" CHILD THE VICTIM OF ANKYLOSTOMIASIS

average European labourer of his age and race. Poverty, venereal diseases and drink play havoc with the "Poor Whites," and, of course, some are suffering from the effects of ankylostomiasis and chronic malaria. In Barbados there is not, as I once thought, "*a fair field and no favour*" for judging the question of the adaptability of the white race for prolonged residence in the Tropics. Malaria, it is true, is absent, but ankylostomiasis is common and is specially prevalent amongst the "Poor Whites" of that colony. It is *a pity something cannot be done for the children. They attend school, recite* Dr. BRANCH'S "Health Catechism" in a parrot-like fashion, unaided by pictures or diagrams, and some of them show promise. Here is an opportunity for a wealthy *philanthropist to save the offspring of the "Poor Whites," and give them a fair chance in*

Ankylostomiasis

life! Considering the ancestry of some of them, there is no saying what surprises such a scheme might produce. One certainly feels that—

> "Some mute, inglorious Milton here may rest,
> Some Cromwell guiltless of his country's blood."

White races in the Tropics

The question of the "Poor Whites" leads us to the larger question of the White Race in the Tropics. Some new facts have accumulated and some fresh statements have been made since the problem was last considered by this Society. For example, CHAMBERLAIN has recorded the results of his investigations in the Philippines, both as regards the physiological activity of Americans in these islands and the influence of tropical residence on the blood. His conclusions will surprise some of you and please others, for, as regards the first subject, he says:—

1. It seems probable that climate, *per se*, exercises little, if any, harmful influence on Americans in the Philippines.
2. By far the larger part of the morbidity and mortality in the Philippines is due to nostalgia, isolation, tedium, venereal disease, alcoholic excess, and especially to infections with various parasites.
3. The facts justify the hope that the progress of tropical sanitation may ultimately permit the permanent colonisation of certain parts of the Tropics.

Has the American occupation of the Philippines lasted long enough to justify these views? Will the results apply equally well to the protected and healthy offspring of Americans wholly reared in the Philippines? I cannot say, but we find similar opinions expressed by the Administrator of the Northern Territory of Australia, and by Drs. HOWSON, HOLMES and MAPLESTONE, while so great an authority as Surgeon-General GORGAS is also in accord. Moreover, here is an interesting note which I came across in the *Indian Medical Gazette* for November, 1914:—

"The possibility of a Northern European race acclimatising itself in the Tropics is one of vast importance, and especially to the inhabitants of Australia, as so much of the northern portion of that island continent is within the Tropics.

"Theories are many and facts are few; therefore it is worth while here giving some details of a genuine example of an unintended experiment in this direction as narrated by Mr. J. Macmillan Brown in his recent book, *The Dutch East* (Kegan, Paul & Co., 1914).

The story of Kissa

"The story is briefly as follows: In 1665, eight Dutch soldiers were sent by the Netherlands East India Company to the little island of Kissa,[1] sixteen miles off the most easterly point of Timor; a fort was built and they were told to watch the Portuguese. The Company forgot all about this lonely outpost, and Sergeant Kaffyn and his men realised that they were, in fact, marooned. They had their wives with them—a guiding principle of the Dutch East India Company. They set to work to build houses and cultivate the land. The descendants of these eight couples still remain. They have been wonderfully fertile; in the two-and-a-half centuries the 16 have risen to 300, and they are a sturdy race with no signs of any evil effects from inter-breeding. They still keep their blood pure and still have big families, and many have fair European faces and

[1] The Island is naturally dry and barren, hence, presumably healthy.

complexions, and many children have light hair and blue eyes. These people had to work, and work hard, and the consequence is that after 250 years in this tropical island they are still fertile—indeed prolific—and still keep their North Europe characteristics."

As regards blood changes, I had an idea that possibly the pallor of Europeans long resident in the Tropics, and that of the healthy "Poor Whites," was due to a certain grade of anæmia which was really a physiological and prophylactic change. The plethoric man does not usually find tropical conditions to his liking, and I fancied that Nature might possibly aid the Caucasian to withstand adverse conditions by slightly altering his blood state. *If* CHAMBERLAIN *is correct, this hypothesis is not valid, for in his paper on "The* Influence of Tropical Residence on the Blood" he tells us that his observations showed that examination of white men after a year or more of residence in the Tropics gives an Blood changes

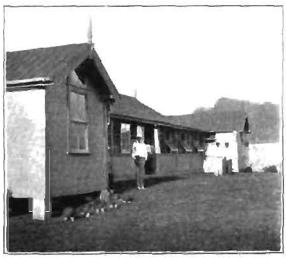


FIG. 16.—TUBERCULOSIS HOSPITAL NEAR ST. GEORGE'S, GRENADA

FIG. 17.—PEIVY BUILT OVER THE SEA, COUYAVE, GRENADA

average erythrocyte count well above 5,000,000, a hæmoglobin percentage between 88 and 90, and a colour index ranging from 0·82 to 0·88. For Filipinos, the average hæmoglobin estimations were 93 *per cent.* These figures do not indicate an impoverished condition of the blood. The expression "tropical anæmia" is often found in the earlier treatises on the diseases of hot countries, and is still heard not infrequently. It is his belief that such a condition, *due to the effect of climate per se*, does not exist. More recent investigations have shown that much of the anæmia formerly classed as "tropical" was in reality secondary to infections with plasmodia, uncinaria and leishmania.

It would seem, as MUSGRAVE and SISSON maintain, that the pallor of the skin is merely due to a local vasomotor condition, a cutaneous ischæmia.

Considerations of space forbid further reference to this interesting question, and indeed Grenada itself cannot claim much more attention. Malaria exists in its river valleys, but, in Dr. COCKIN'S absence, I was unable to get accurate information as to the type chiefly in evidence. Endemic filariasis, as Dr. LOW has noted, an observation Diseases of Grenada

confirmed by Dr. COCKIN, is exceedingly rare. Why should this be so? Ankylostomiasis is rampant, but has now happily been taken in hand, and we may look for better things. It is at first strange to find that, amongst the negro population, tuberculosis, and more especially phthisis, ranks first as a dealer of death. A little familiarity with the conditions of life soon makes it clear why this is the case. The negro lives in a world peopled by Jumbis and malevolent spirits. These are especially to be dreaded at night, and consequently every crack and cranny of the cabin is closed against them. Overcrowding,

Tuberculosis

FIG. 18.—DEPIGMENTATION IN HINDU WOMAN, GOUYAVE GRENADA
From a Photograph by Dr. SAMBON

bad ventilation, and a natural proclivity of the negro to the disease it induces, give the *Bacillus tuberculosis* every opportunity. Grenada, however, has risen to the occasion. Thanks chiefly to Dr. HATTON, a tuberculosis hospital, of which I show you pictures (Fig. 16, *page* 45), is in *full* swing. Few hospitals in the world can command such a site and such a view as this little sanatorium.

Sanatorium

I visited the town of Gouyave, where I met an old Edinburgh man, Dr. O'NEALE, took some photographs of sanitary interest (Fig. 17, *page* 45), and saw a very curious case of what was stated to be pinta in a coolie woman. Dr. SAMBON had seen this case when he visited the island, and I show you a photograph he took of it (Fig. 18). I doubt very much if the condition had anything to do with pinta. The white skin was so healthy and elastic that I began to wonder if the so-called coolie had not once been a European who had been

stained. I cannot say, but it is certainly a very remarkable case of depigmentation. Albinism amongst the negroes is not very uncommon. Here is a photograph of what we may call a piebald family (Fig. 19). Dr. MITCHELL, of St. George's, kindly gave me the print. Albinism

In Grenada, as elsewhere, there is a large ant with urine-loving propensities. Its possible rôle as a disease-carrier must not be overlooked.

FIG. 19.—ALBINISM IN A NEGRO FAMILY, GRENADA
From a Photograph by Dr. MITCHELL, ST. GEORGE'S

A word as to the south end of the island, where there is a spot once an indigo plantation and so known as "True Blue." There the conditions are wonderfully African in type, and enormous centipedes can be found. One would fain linger on Grenada as one was fain to linger in it, but the fact that from its southern extremity the distant northern mountain ranges of Iere—the land of the humming-bird—can, in very clear weather, be descried, brings Trinidad and its problems into mind, so we will journey to the Gulf of Paria and Port of Spain. "True Blue"

TRINIDAD

Sanitary reform

I landed in this Island over twenty years ago—in August, 1893, to be exact—and though in those far-off days I had not fully acquired the "sanitary eye," I think I can say that I was blessed with an enquiring one. Hence, I can testify to the great change which has taken place in that capital—a sanitary revolution due largely to the labours of Surgeon-General CLARE and some of his staff—notably Dr. DICKSON. It has not been an easy task, but already the results are in evidence (Fig. 20), and if the same principles can be applied to the colony as a whole, Trinidad will have every reason to esteem itself a fortunate isle.

FIG. 20.—SANITARY DUST-BIN
PORT OF SPAIN, TRINIDAD

There is much I might say about this, our most important West Indian possession, for, in the stimulating company of Mr. F. W. URICH, the Government Entomologist, I ranged far and wide; collected diseased Simulium larvæ[1] in the beautiful verdant vale near Arima, where the Madre de Cacao, the glorious Bois Immorte, spreads its vivid scarlet flower clusters against a sky of purest sapphire; witnessed the Atlantic combers bursting in snowy foam upon the long beach line of the wind-swept Cocal, with the so-called "four-eyes" spluttering in the back-wash and defying capture; plunged into the mysterious High Woods and was thrilled and awed, as was KINGSLEY long ago; looked once more upon the Pitch Lake, now shorn of much of its weird beauty, thanks to clearing operations following "Yellow Jack"; visited the Leper Asylum and noted the noble devotion of the French Catholic Sisters; saw Dr. SEHEULT at work in the Colonial Hospital; and spent days prowling round cow-sheds, opium dens, latrines and public urinals with Dr. DICKSON, realising to the full the truth of these words—

"Where every prospect pleases
And only man is vile."

One is dealing with problems, however, not with prospects, so let me direct your attention to those which are, perhaps, the most interesting:—

Kala-azar

1. Why has kala-azar never been found in Trinidad, or, for that matter, in Jamaica? For many years a stream of East Indians, some of them from leishmaniasis areas, has been pouring into both these colonies. It is surely reasonable to suppose that amongst all these thousands of coolies some, when they left India, were in the incubation period of kala-azar, or were even in an early stage of the disease! Yet kala-azar has not been found. Dr. DICKSON tells me he has been on the look out for it, but has never come across *Leishmania donovani*. Is not this curious? It is true that in the New World generally

[1] They were infected with a species of microsporidium.

this parasite does not seem to have gained a footing. Only one case of infection is recorded in the literature, that at Manaos on the Amazon, and it does not seem to have been introduced.[1]

Is observation at fault, or is the insect-carrier absent? Personally, I am inclined to think the disease must be present and has not been recognised, but I saw nothing of it either in Trinidad or Jamaica, though, of course, my investigations were very limited.

Malaria

2. There is a big scheme afoot for planting bamboo, as a source of paper pulp, on a large scale in Trinidad. How will this affect the malaria question there? Cut bamboos, unless severed at the nodes, leave ideal breeding-places for anophelines. The hollow stem can, of course, be plugged with tar, but that would be a heavy task. Might something be done by having a cleared area round the plantation, and dotting trap-breeding pools here and there? This is at least worth *thinking* about.

Plague

Yellow fever

3. Plague runs as an epizootic in rats. Can yellow fever exist as an epizootic in monkeys, and especially howler monkeys? I have already considered the possible relationship of the indigenous monkeys of South America to obscure outbreaks of this disease, and Dr. Low has replied to my hypothesis. With most of what he says I am in entire agreement, but I think that in his letter he tended to overlook the point on which I wished to lay special stress. This being so, it is perhaps better to discuss the matter at some length, as, since writing my note to the *Lancet*, I have obtained some further information of considerable interest. On my way to the West Indies, I was told by a lady, Mrs. RANDOLPH RUST, who has been long resident in Trinidad, that the old negroes there say they can always tell when there is going to be an epidemic of yellow fever in the island, owing to the fact that, prior to its appearance, the red howler monkeys are found dying and dead in the High Woods. In view of MANSON'S injunction to search for a reservoir of the virus amongst some of the lower animals, this negro statement struck me as curious and interesting, though naturally one did not place overmuch credence in it.

Negro belief

When I reached Port of Spain this monkey question assumed fresh interest. Dr. CLARE gave me particulars about a recent small outbreak of yellow fever at Brighton, the port for the Pitch Lake in the south-west of Trinidad. Briefly this is what happened:—

One of the American engineers engaged in oil-boring operations arrived in Trinidad from Guanaco, on the Venezuelan mainland, five days before being attacked with yellow fever, of which he died on the fifth day of his illness. He was struck down six days after leaving Guanaco, and Dr. CLARE told us that for the last twenty-five years for which records are available no case of yellow fever is known to have occurred at that place. In my opinion this does not, of course, wholly exclude an infection acquired at Guanaco, or upon the steamer in which he travelled, although in any case the incubation period would be lengthy, but Dr. CLARE was convinced that it had not been so acquired. Mark, however, what followed. This man was employed at a spot eight miles in the heart of the dense virgin forest, at the end of a road which had recently been constructed through

[1] At the same time, cutaneous and the so-called oro-nasal forms of leishmaniasis are common.

the leafy wilderness. In this locality red howler monkeys are known to occur. Associated in work with this man was another who had not been out of Trinidad for more than eighteen months. This second man was also struck down with yellow fever on the same day and almost at the same hour as the first case. He eventually recovered. As Dr. Low admits, it is not easy to account for infection in this case, provided the medical enquiry was adequate, which, speaking from memory, I believe to have been the case. The other cases, eight in number, two of which proved fatal, need not be considered. They are all explicable by the ordinary man to mosquito and mosquito to man infection.

Dr. GEORGE, who carefully investigated the outbreak, attributed it to some unknown cause in the oil fields amongst the forest.

Upon enquiry, I found that several people knew all about the negro belief of which I have spoken. Mr. RUST got hold of his chief hunter, who confirmed the negro statement in every particular, and said that before the last large epidemic of yellow fever in Trinidad the red howlers were found dying and dead in large numbers. Further confirmation was forthcoming from Mr. F. W. URICH, Entomologist to the Board of Agriculture, an acute and trained observer, who told me that he himself had seen the monkeys lying dead, and at the time thought they had probably perished from the effects of a protozoal blood parasite. He had not, however, specially associated this mortality with the subsequent outbreak of yellow fever.

Epizootic in monkeys

A point of possible interest is that in these High Woods a species of wild stegomyia, called *Ædes sexlineata*, exists. It is very like the known yellow fever carrier.

FIG. 21.—NET TO GUARD NECK AND PART OF FACE FROM STEGOMYIA BITES. DR. GEORGE, TRINIDAD

The two men first and wellnigh simultaneously attacked were working on an oil well at the end of the new asphalted motor road already mentioned. They spent ten hours a day on the oil fields, going there every morning from Brighton and returning every evening. In this connection it is well to remember that *S. fasciata* bites by day as well as by night. In water collections at a bungalow, which stood in the clearing at the end of the road, Dr. George found *S. fasciata* breeding when he visited the place (Fig. 21). As I have said, monkeys occur at this spot, but there was nothing to show that they had been sick or dying.

History of outbreak

Granting that the first case got infected in Venezuela, although there is no evidence to that effect, how are we to explain the second case?

It may be affirmed the disease was not yellow fever. In reply I can only say that both cases were typical, with jaundice and albuminuria, and that the diagnosis was confirmed post-mortem in the first case, and also in subsequent cases. Could the man first attacked have conveyed an infected mosquito ashore in his baggage? This is not a very probable contingency, but cannot be altogether excluded.

Was yellow fever present in a mild and unrecognised form amongst the coloured employees of the American Company, or amongst the negro population? Careful enquiries were made by Drs. GEORGE and CAMPBELL, who decided that such was not the case. Let it, however, not be forgotten that some medical men maintain that yellow fever is endemic in Trinidad. Of this, I believe, there is absolutely no proof, albeit it is not an easy thing to disprove.

Animal reservoir not essential

There remains the hypothesis I have advanced. Needless to say I do not wish to urge that the monkey, or indeed any of the lower animals, is an *essential* factor in the spread of yellow fever, but I suggest that certain obscure outbreaks, like that in Trinidad, may possibly be explained on such an assumption, and I submit that it is at least very desirable that the liability or otherwise of the indigenous monkeys of South America to yellow fever infection should be ascertained. Dr. AGRAMONTE, of Cuba, with whom I discussed the matter, agreed with me on this point, and it must be remembered that his unsuccessful inoculations were carried out upon Rhesus monkeys, originally natives of India.[1]

As I said before, there may be nothing in the idea, but I am told that in certain parts of Brazil a mortality in monkeys is known to accompany yellow fever outbreaks, and certain isolated epidemics in Colombia could be explained on such an hypothesis.[2] Man and the wild monkey rarely come into close contact, but they do so now and again, as possibly in the High Woods of Trinidad, and opportunities for infection might occur.

When yellow fever raged at Gibraltar, in 1828, the monkeys, probably an African species, died in large numbers; but, of course, mortality amongst other animals has been noted in yellow fever outbreaks.

Still, it is an interesting fact that the distribution of the genus Alouatta, of which *A. seniculus* is the red howler, corresponds in South and Central America fairly closely to the known distribution of endemic yellow fever. It may be a mere coincidence, but at least it would justify the experimental work I have suggested.

Need of further knowledge regarding yellow fever

We know so little about some phases of yellow fever that anything which might throw fresh light upon it would undoubtedly be welcome, and if one is careful not to change hypothesis to fact, no great harm can be done, and in some instances benefit may accrue.

As we are talking about yellow fever, I may say that I have been wondering if, during its epidemic prevalence, the employment of blood tubes, like those with which RODHAIN fed his captive tsetse flies, might prove useful. If stegomyia were found to feed on them greedily, there might be a smaller number of human beings bitten, and hence a lessened chance of infection.

Any such scheme would have to be combined with vigorous anti-larval measures, for the provision of blood-feeds would probably tend to increase breeding operations.

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[1] Since then NOGUCHI has apparently discovered the cause of yellow fever to be a leptospica, and has succeeded in transmitting infection to marmosets, *Midas œpidus*, *M. geoffroyi*, whose natural habitat is Central and South America. South American ring-tailed monkeys proved refractory. He did not employ howler monkeys.

[2] Recent work by the Rockefeller Commission shows that in certain regions isolated epidemics are probably to be explained by what may be called "relay" infections, which are apt to pass unnoticed.

VENEZUELA

The voyage from Port of Spain to Ciudad Bolivar on the Orinoco, was made on the Venezuelan river steamer "Delta." It was then that I appreciated the real reason for the notices on the Royal Mail boats, with a reference to which I commenced this paper. All through Venezuela and Colombia one finds the disgusting and dangerous habit in vogue of throwing used toilet paper on the floor or into a small wooden box on the floor, and not into the pan of the water-closet. The subject is not a pleasant one, but I make no apology for mentioning it, for, apart from anything else, each of these countries is, like Egypt, a land of flies. In each enteric fever is prevalent, as are diarrhœal diseases generally. Is it any wonder? The custom is by no means confined to the lower orders. One finds it practised in better-class hotels, though, of course, not by educated Venezuelans or Colombians who have travelled in the United States or Europe. I enquired how this peculiar habit had originated. It appears that the earlier types of water-closet used in these countries had very imperfect flushing mechanisms and constantly gave trouble. Distrust was thus engendered, and so it is the plumber or the engineer who was originally to blame. It is not the first time that these gentlemen have upset the sanitary apple cart!

Insanitary habits

I wish I had time to describe the delta of the Orinoco as I viewed it from the Macareo Channel, and thought of Raleigh and his sweating seamen labouring in their clumsy boats against the mighty current. Mansonias and sundry Tabanidæ boarded us, together with the little green and vicious Lepidoselaga, which I was to meet and feel later, both on the Magdalena and the Atrato.

Flies and mesquitoes

At daybreak one morning I saw a family of capybaras emerge from the forest, but looked in vain for jaguars and anacondas, though the jaguar is sometimes seen in the delta, where it is common. I mention the capybaras especially, because it would seem that in certain parts of Venezuela they may act as reservoirs for the parasites of "Renguera," a trypanosomiasis of equines. At any rate, it is known that before outbreaks of this disease in horses, capybaras, agutis, aguchis and pacas, all water-loving rodents, die in large numbers. If this supposition is correct, these animals form a different kind of reservoir to the big game of Africa, which do not suffer from the infection. The condition must be more like what is met with in rats before plague epidemics.

Animal trypanosomiasis

The scenery of the Orinoco changes completely once the delta is left behind. The shores are sandy and rocky, with low hills in the background covered with bush or sparse forest. At the famous narrows, called Angostura, 230 miles from the river's mouth, one reaches Ciudad Bolivar, the capital of the large state of that name. It was formerly known as Angostura, and gave its name to the popular bitters now manufactured in Trinidad.

Ciudad Bolivar

Ciudad Bolivar is a city set on a hill, which cannot be hid—a picturesque spot, with much of interest for the tropical hygienist (Fig. 22). The Hospital Ruiz is the centre of its medical life, and here I found Dr. FELIX PAEZ busy with his microscope and upholding the torch of tropical medicine in this somewhat remote part of

the world. To him and to his colleagues, as well as to the courteous Government officials, I would take an opportunity of expressing my thanks and gratitude for much kind hospitality and assistance.

FIG. 22.—STREET SCENE IN CIUDAD BOLIVAR
Showing central channel with stop-waters and blocked grating

One of the problems for the sanitarian, and especially for the sanitary engineer, is how to get rid of the large lagoon which at certain seasons of the year is present on the low-lying land to the east of the town, and also how to carry the surface drainage to the river. Part of it runs on to this low-lying land, forming dirty and swampy areas where pigs love to wallow, and where vultures pick up a living. Need of drainage

With very little trouble, and at a comparatively small cost, Ciudad Bolivar might be made a very healthy place. At present it has a death-rate of something like 23 per 1000, its population being about 20,000.

Another problem I encountered was concerned with the diagnosis of a peculiar disease of the nose. It did not seem to be leprosy, or lupus, or syphilis, or espundia, or gangosa. I do not know what it was, but it may be identical with a condition called Bubon de Velez, which is supposed to be confined to the province of Velez in Colombia. Dr. PAEZ showed me cases of malarial splenomegaly and blackwater fever. There is a fine field for work in Ciudad Bolivar. Diseases

As I have mentioned South American malaria, I would remind you of the well-known fact that in Brazil and elsewhere there is a quinine-resistant strain of plasmodium. ZIEMANN thinks that this is the result of the malaria-stricken population having for a great number of years been saturated with quinine, to the action of which the parasites have acquired a tolerance. He thinks it would be a great matter to find a safe and easily administered drug which might take the place of quinine. Such a drug may, I think, possibly be forthcoming from *Nectandræ cortex*, or Bebeeru bark, derived from *Nectandra rodæi*, the greenheart tree of British Guiana, which belongs to the Lauracea. It was used long ago in cases of ague, and often with success, but at times it appeared to fail, and fell into disuse. Considering our more exact methods of testing drugs, both clinically and chemically, and our improved knowledge of tropical fevers, it seems to me it merits further investigation, and I am arranging for this to be conducted.[1] The cattle trade of the Orinoco is a big business, and interesting from the veterinary standpoint. The quarantine station and splendid slaughter-house at Port of Spain testify to its importance. Malaria

We must, however, again get under weigh, run out through the northern Bocas, once traversed by the immortal Nelson and his battleships, touch at that unsavoury and Other cities

[1] Sir RONALD ROSS kindly had a trial made of material with which I supplied him. Unfortunately, it proved ineffective.

unhealthy spot Carupano, famous only for its superb rum, look in at Margarita Island with its pearl fisheries, and then attain the mainland, creeping under the shadow of that huge Sierra which rises wellnigh sheer from the rim of the Caribbean, and recalls the great sea captain, Amyas Leigh, and the romance of *Westward Ho!* There is not much romance about the modern La Guaira, a terribly hot, dusty and dirty place. Macuto, the Brighton of Caracas, a little farther east, is distinctly better; but one is thankful to speed up into the clouds upon the wonderful mountain railway which is under the direction of an able and genial Scot much interested in questions of snakes, scorpions and medicinal plants. Three thousand feet nearer heaven we find the remarkable university city of Caracas, aptly described as "a capital of beautiful prospects and beautiful women." Here, however, we are concerned with Caracas from the medical and sanitary standpoint.

Caracas

FIG. 23.—STATUE OF DR. VARGAS. HOSPITAL VARGAS, CARACAS, VENEZUELA.

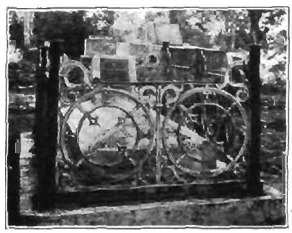


FIG. 24.—GRAVE OF BEAUPERTHUY
From a Photograph by Dr. SAMBON

Dr. CAPRILES, Director of Civil Hospitals, proved a capable and kind guide to things clinical. Under his auspices I visited the Hospital Vargas; I show you a picture of a fine monument to Dr. VARGAS (Fig. 23), the father of Venezuelan medicine. I would, however, remind you that a greater medical name than that of VARGAS is associated with Venezuela, for in that country lived and, I believe, died the far-seeing BEAUPERTHUY, a prophet as well as a priest of the goddess Hygieia. I learned, what I did not know before, that he finally devoted himself to the study of leprosy, contracted that disease, and fell a victim to it at Cumana. If this is so, how comes it that Dr. SAMBON was able to give

Hospitals and Institutions

me the photograph of his grave (Fig. 24)? The grave is in the Penal Settlement Cemetery, Mazaruni River, British Guiana. Was his body transferred there for burial?

He would doubtless have been glad to witness the quickening of the interest taken in sanitary matters at Caracas. There was, and is, urgent need for it. The principal hotel, under German management be it noted, is best described as a mouldy place, where the food predisposes to colic and the stair carpets might have done duty in Noah's Ark. The climate of Caracas is wellnigh perfect, its site is superb. No one should die there except from old age. Unfortunately, there is a very different tale to tell, simply because the authorities have in the past neglected to carry out proper sanitary measures. I have not time to go into details, but would draw attention to the peon filling water barrels from a stream (Fig. 25)! It is not, however, water which is going into those barrels, it is

Climate

FIG. 25.—BALING WATER FROM SEWAGE-LADEN GUAIRE RIVER FOR USE IN WATERING STREETS, CARACAS, VENEZUELA

diluted sewage. The stream is the Guaire River, into which a great part of the sewage of Caracas runs, and the bare-legged gentleman in the stream is obtaining his supplies well below the city and the outfall.

You, doubtless, suppose that the barrel contents are to be used for agricultural purposes. Not at all. They are for watering the terribly dusty main road running out of the city to the east, a road with much motor traffic upon it. Is it any wonder enteric fever is rife in Caracas, and all diarrhœal diseases common? Yellow fever used to be frequent, but I am glad to say is now being fought, and well fought, with gratifying results. So is ankylostomiasis; and here and in Colombia they largely use higueron, the sap of *Ficus laurifolia*, a well-known anthelmintic, said to act like a charm in

Insanitary conditions

Higueron latex

trichocephaliasis. If all that is claimed for this drug be true, it is time it came into more general use. At present the latex is taken mixed with coffee. It is believed an alkaloid is present in the sap. If this can be isolated, a valuable preparation may be forthcoming to take the place of thymol and beta-naphthol. Time will show.[1]

Laboratory

A few years ago Venezuela celebrated the centenary of her independence. Most of the foreign powers presented gifts. Great Britain did not, possibly because it was thought that we had given enough in the form of the famous 5000 British legionaries, those superb veterans from the Peninsula and Waterloo, who played so great a part in freeing both Venezuela and Colombia from the Spanish yoke, and about whom precious few people in this country know anything at all. Note what Germany did! She presented a very fine and complete laboratory equipment for hygienic work. I have seen it and can testify to its excellence.

In the new laboratory reigns Dr. GONZALEZ RINCONES, so well known for his entomological work. I found him engaged upon the fascinating problem of how and why the Janthinosoma mosquito acts as a transporter of the eggs of *Dermatobia hominis*. To this mosquito the picturesque name "Aeroplane of the Macaw Worm" has been given, and apparently only the female is engaged in the transmission. Now how does the mosquito get the eggs from the fly plastered on to her abdomen? Does she pick them up haphazard, or are they carefully deposited by the mother Dermatobia?[2] Thanks to Dr. GONZALEZ, I am able to show you the actual insect itself with the fly eggs *in situ* (Fig. 26). In the private laboratory of Dr. ITURBE, I saw locusts being killed by the *Coccobacillus acridiorum* of Hérelle—a most interesting and hopeful sight. It has recently been employed by BÉQUET with some success in Algeria. I cannot take farewell of Caracas without expressing my great indebtedness to Mr. HARFORD, C.V.O., the British Minister,[3] and to Dr. GUEVARA ROJAS, both of whom smoothed the way for me on manifold occasions.

FIG. 26.—EGGS OF DERMATOBIA HOMINIS ON ABDOMEN OF JANTHINOSOMA LUTZI

Lake of Valencia

From Caracas, accompanied by Dr. CAPRILES, I journeyed in a motor car to the Lake of Valencia, 70 miles to the west—a thing I hope never to do again. The

[1] Investigations carried out by Dr. PYMAN, formerly Director of the Wellcome Chemical Research Laboratories, indicate that no active principle is present, and that the drug probably acts mechanically as a kind of rubber solution, coating and entangling the worms. The late Dr. SANDWITH kindly tested the drug for me in a few cases of ankylostomiasis, but found it unsatisfactory.

[2] NEIVA and GOMEZ have shown that the latter is usually the case. (*See* "Review of Applied Entomology," Series B, April, 1919).

scenery was admirable, the road very much the reverse. inches—I had almost said yards—deep in sand in many places, seamed by huge ruts—I had almost said dongas—and, in places, of an amazing steepness, and with terrifying curves. I now feel rather proud that I did not take the train back; at the time, and for some days subsequently, I felt I had been a fool. When in the rear of herds of Andean cattle, one was smothered in foul dust. The driving was like that of Jehu the son of Nimshi, and, as a result, one flew from side to side like a parched pea in a pan, was driven violently upwards from the seat, was thrown as violently forwards, and was eventually, holding fast by a rail, forced to balance oneself in the air between earth and heaven, like the coffin of Mahomet.

Lake of Valencia

The Lake of Valencia presents a problem. It has no outlet; twenty-two rivers run into it, and yet it is slowly drying up. We notice here the abundance of aquatic growth closely resembling the sudd of the Upper Nile. Malaria, of a very severe type, is prevalent along the shores of this lake. The little posada at Maracay, where I stayed, was alive with mosquitoes, nearly all Culices.

CURAÇAO

In order to reach Colombia, it was necessary to go to the Dutch island of Curaçao. I went there from La Guiara in an abominable Norwegian tramp steamer flying the American flag. It also took me to Maracaibo. Curaçao is not the least like the usual West Indian island. Its general aspect and some of its flora strongly suggest Africa. It might almost be a chip of the veldt transported to the Caribbean. This being so, I was not very much surprised to come across a flourishing ostrich farm, with a stolid Egyptian fellah looking after the birds. The capital is like a little town in Holland. I spent a long time trying to find a dirty place in it. I discovered one at last, in the neighbourhood of negro cabins on the slope of a hill, but even this dumping ground was not very bad. Everything was too dry for great offence to result. The narrow harbour, widening out into a wonderful lagoon, suggests pirates, and, indeed, there is still an old pirate house upon one of the wharves. One of the principal diseases in the island is diabetes. It seems that this may be due to the fact that Jews form a large proportion of the better-class population, and this race is known to be specially liable to diabetes. Nephritis and erysipelas are also said to be common. Curaçao, with all its virtues, scarcely suggests tropical research. It is too much of a health resort.

MARACAIBO

Maracaibo

The same cannot be said of Maracaibo, on the mainland, at the entrance to the huge gulf of that name—a curious little city, a fine business centre, and visited periodically by yellow fever. Forty cases cropped up shortly after I had left it. Dr. COATES COLE is a leader in the local medical life here, and holds quite a unique position.[1] He has had great experience of severe malaria, which, let it be noted, he invariably treats by intramuscular quinine injections; and of yellow fever, in which he finds a French antipyretic—cryogenin—of great service. You will be glad to know that it is meta-benzamine semi-carbazide.

[1] Unfortunately, he has since died.

He took me to the leper settlement on Providencia Island, a truly horrible place. Picture wretched people without any faces at all, others with faces like nothing human, miserable, deformed creatures and, alas! little patients, some just beginning to develop the disease; for the healthy children born of leper parents are not removed from the lazarette, but are allowed to take their chance. White, black and yellow inmates of both sexes and all ages, there they are, wonderfully cheery in what looks like misery and wretchedness, while out in the yards the lean black vultures strut and peck. It reminded one of Kipling's Indian lepers and the crows. I have never seen so depressing a place, and yet the patients are well enough fed, and, for the most part, do not seem unhappy. A few do well under energetic treatment with refined Chaulmoogra oil: the majority are doomed. The wards were ill-kept and dirty, but the devotion of the nurses is beyond all praise.

Leper colony

COLOMBIA

Returning to Curaçao upon the ancient tramp, I succeeded eventually in catching an Italian steamer which landed me upon the long pier at Porto Colombia. Thence I journeyed to Baranquilla, a fairly prosperous but unfinished-looking town, which need not detain us. *Stegomyia fasciata* was said not to occur in the place but I caught one the only night I was in it.

There is a saying that it is about as easy to get to Bogotá as to heaven. It may be so; certainly it is a long journey from the coast to the Colombian capital, and the worst of it is one never knows how long it will take. It may be ten days, it may be a month or more. It all depends on whether your steamer sticks fast on a sandbank or not. The Magdalena is a great and noble river, but no one can say what it will do next in the way of shifting its navigable channels. The journey took me sixteen days, but I stopped for three of them at Mariquita, in the province of Tolima, the guest of the manager of the La Dorada Extension Railway, Mr. THOMAS MILLAR.[1]

River journey

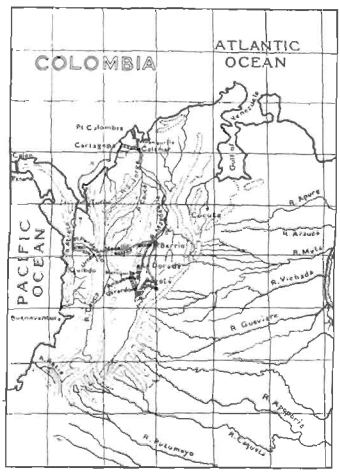


FIG. 27.—ITINERARY IN COLOMBIA, 1914

[1] Now, unhappily, deceased.

I would like to describe the river life, the strange food, the caimans and turtles on the sand-spits, the gorgeous macaws speeding across the huge water stretch, the noisy parrots, the black monkeys in the tree tops; but considerations of space forbid. The forests are truly wonderful, but wellnigh impenetrable. The bird and insect life is fascinating, but of larger wild mammals one sees next to nothing. The heat at times was almost unbearable, and the climate is undoubtedly very trying to Europeans. Scorpions come on board the steamers with the wood fuel. When a member of the crew is stung and has succeeded in catching the aggressor, he splits the latter open and applies its internal organs to the puncture, with, it is said, beneficial results. This is something like the custom of swallowing a snake's gall bladder in the case of a snake-bite. River life

Among the biting flies which I collected was probably a new Simulium, now in the hands of Dr. KNAB. I chased a Lepidoselaga half the morning and failed to capture it; a spider, however, succeeded where I failed, and eventually I took both locked in an embrace which could scarcely be called a loving one. Biting flies

Honda, an interesting old town, has a reputation as a good place for phthisical folk. I found quite a little colony of recovered Welshmen there, men sent out almost in a dying condition, but now doing useful work. Honda

From Mariquita, on a plateau of the same name, a magnificent view of the Andes can be obtained. Through it courses the Guali River, coming from a region of gold mines. It is said that the red, clay-stained and sewage-polluted waters of this river cause, or rather caused, goitre, which is common in the district. When another source of supply became available, it is asserted that the goitre decreased. This is interesting in the light of MCCARRISON'S views on the subject, as is the statement that in the province of Antioquia, to which I shall presently introduce you, goitre is comparatively rare, owing to the fact that the Antioquian waters contain iodine. Certainly in Colombia the goitre problem might be tackled with advantage. The disease is more common in women. Under the flanges of the rails on the La Dorada Extension Railway, running from La Dorada through Mariquita to Ambalema on the Upper Magdalena, above the rapids, I found many so-called "Cojo" spiders, brilliant creatures with bright red globular abdomens spotted with black markings. They belong to the genus *Latrodectus*, and are said to be very venomous. I was credibly informed that a bite from one of them had proved fatal within twenty-four hours in the case of a healthy railway peon, but I fancy their deadliness is somewhat exaggerated, though typical specimens of this genus are undoubtedly poisonous. Goitre

Insects pests

On the way to Ambalema one was pestered by tiny Hippelates flies, which constituted themselves a nuisance.

Another steamer journey brought one to Girardot, and there the hotel had a notice priding itself on its excellent sanitary condition. In order to impress this upon the visitor, there was a large earthenware bowl full of water and sunk into the soil in the patio, and the water was simply alive with culex and stegomyia larvæ. I would like to have fined the proprietor. All I could do was to deliver a mild lecture in execrable Spanish and to see the bowl baled dry.

From Girardot one climbs into the clouds by a mountain railway, reaching at one place an altitude of 10,000 feet above sea level. The sudden change from intense and Railway journey

steamy heat to the chill air of the Upper Andean slopes undoubtedly predisposes to bowel troubles. I have little doubt that the consequent diarrhœa is analogous to the well-known hill diarrhœa of India. The famous Sabana, a great and lofty plateau, is reached at last, and, after changing trains at Facatativa, a short journey across a level stretch, reminiscent of the Lombardy Plain, brings one to the quaint and comparatively venerable city of Bogotá, nestling on the lower flanks and at the base of the huge twin buttresses of Monserrate and Guadalupe. Here there is a School of Medicine, and

Bogotá

considerable activity in sanitary work. A graduate of Harvard, and a Fellow of this Society, Dr. José Montoya, constituted himself my guide, philosopher and friend, and under his auspices I visited the hospitals and saw what I could in the way of tropical medicine. There are plenty of cases, many coming from the unhealthy Llanos to the south. They find their way, these poor peons, into the San Juan de Dios Hospital.

Fig. 28.—Early case of Gangosa in a Colombian, Bogotá

Fig. 29.—Advanced case of Gangosa in a Colombian Negro, Bogotá

Doubtless the conditions there are an improvement upon those in their own poverty-stricken dwellings, but there is no use in concealing the fact that in certain respects this large and ancient hospital is about a hundred years behind the times. The reason is not far to seek, though this is not the place to discuss it. Let it be said, however, that it is not the fault of the enlightened little party of medical men who are struggling to remedy conditions which are a blot on the escutcheon of the capital.

Hospitals and Institutions

This hospital, which I gather is always overcrowded, dates back to 1770. In one of its courtyards stands the dissecting-room of the medical school, recalling conditions, aye and producing conditions, once obtaining in Vienna. In another I found the washing out to dry, and promptly photographed it. The tiles covering the roof of the wash-house were of the most wonderful tints, vermilion, violet, blue, golden, richest umber and metallic green. One of the ambulances is a Sedan chair. I saw a patient being brought

to the hospital in it, and I hope it will soon be on view in the Historical Medical Museum.[1] Patients lay in rows upon the floor of the wards. All kinds of cases were mixed up together, owing to lack of space, and despite the protests of the medical staff. One saw a victim of ankylostomiasis bloated with œdema, and hard by a wasted dysentery case straining in his misery. Enterics were dotted here and there, and altogether this hospital came somewhat as a shock. It is, however, only fair to say that, thanks to the energy and influence of Dr. MONTOYA and some of his friends, an excellent children's hospital has been erected. The fabric of a new hospital is also under construction, and though money is woefully scarce, we may yet hope to see a building worthy of Bogotá and of its Medical School. To the staff of that School I shall always be indebted for their courtesy and abundant hospitality, while I am under many obligations to the British Legation and its Secretary, Mr. EDGAR BOWLE.

Here are two photographs of interesting cases (Figs. 28 and 29). I am certain they are examples of the condition known as gangosa. Now, what is gangosa? Is it a disease *sui generis*, or is it the result of yaws? At Bogotá they did not recognise the condition, and I believe these are the first cases to be recorded from Colombia proper. I understand a single case has been reported from Panama. Gangosa

Gangosa is another problem worthy of investigation. We will revert to it again when we reach Jamaica.

FIG. 30.—MILK-CAN AND HOG-WASH BARREL ON THE SAME DONKEY AT THE DOOR OF AN HOTEL IN BOGOTÁ

Thanks largely to Mr. WYNDHAM,[2] the British Minister, I was able to see a good deal of Bogotá, and especially of its sanitary problems. The water supply might be better; the sewage disposal *might be very much better*; the milk supply is open to criticism, as when one finds a donkey with a milk-can on one side of it and a barrel for hog-wash on the other (Fig. 30)! At the same time, many of the streets are well paved with asphalt and the city is making progress. It is interesting to see the Padilla spring-water being sold in the street, strings of fish from the Magdalena being carried upon a pole, and to visit the market, which is much more primitive than that of Caracas. Bogotá itself, however, cannot be called a tropical city. It is 9000 feet above sea level, and its climate is temperate; indeed, at times, distinctly cold and rainy. One gets a good idea of the situation by riding out to the verge of the Sabana, where the famous falls of Tequendama, thrice the height of Niagara, fall sheer in spray and thunder from the edge of the plateau to a valley bottom far below (*see* Figs. 31 and 32, *page* 62). Sanitation

[1] It can now be seen there. [2] Now Sir PERCY WYNDHAM, K.C.M.G.

At this spot one finds the warm air from the lower slopes meeting the chill breath of the Sabana and condensing to form those mists of which I am able to show you a picture. Standing thus at a great altitude, and looking out upon the Andes, we may take a medical survey of Colombia as a whole, and so I exhibit some maps illustrating the distribution of certain of the more important diseases (*see* Fig. 27, *page* 58; and Figs. 33, 34, 35 and 36). Professor URIBE very kindly had the maps prepared for me.

Road to Magdalena valley

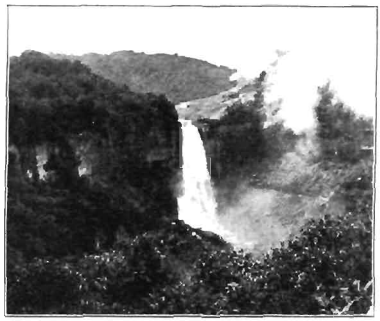


FIG. 31.—FALLS OF TEQUENDAMA, FREE FROM MIST

I returned to the Magdalena Valley, and consequently to the Tropics, by the old Spanish road which runs from Facatativa to Honda. Few who have not seen it can have any idea of what it is like; paved in parts; in parts like the bed of a mountain torrent; of an amazing steepness; of an astonishing miriness once the rains have begun, as they had when I essayed it; commanding every now and then the most superb prospects—the giant snow-clad peak of Tolima soaring to 18,320 feet, the long glistening range of Ruiz, the wonderful river valley lying below one like a gigantic relief map. Mule trains still traverse the road, and until recently every grand piano in Bogotá, let alone minor pieces of furniture, ascended it. Is it any wonder that, for animals, it is a *via dolorosa*—a highway strewn with bones?

Via dolorosa

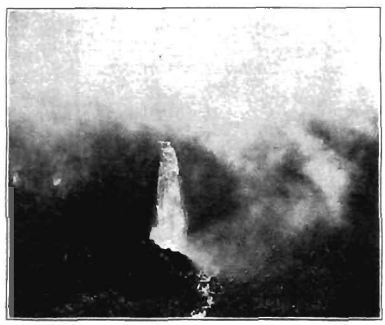


FIG. 32.—FALLS OF TEQUENDAMA, SHROUDED BY MIST
Formed by the cold air of the Sabana meeting the hot air rising from the Tierra Caliente.

In the primitive posadas *en route* one is apt to become infected with the spirochæte of relapsing fever, and the belief is firmly held that bed-bugs are to blame. Fleas are much more in evidence than bed-bugs, and here is a problem requiring solution. In some parts of Colombia a tick, *Ornithodoros turicata*, is known to be the carrier.

Relapsing fever

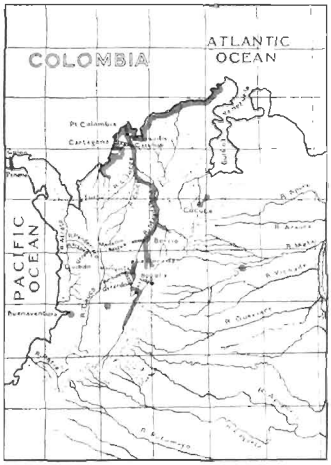


FIG. 33. DISTRIBUTION OF YELLOW FEVER, 1914

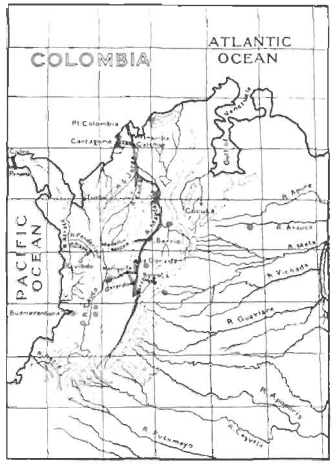


FIG. 34. DISTRIBUTION OF RELAPSING FEVER, 1914

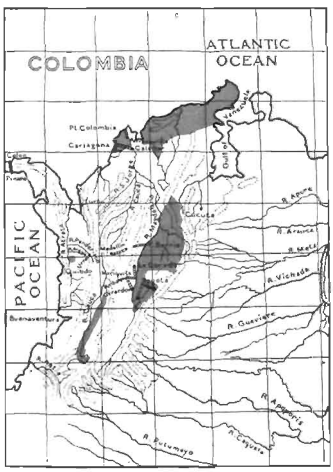


FIG. 35.—DISTRIBUTION OF FILARIASIS. 1914

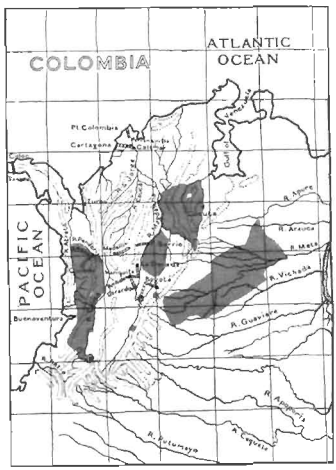


FIG. 36.—DISTRIBUTION OF YAWS. 1914

My objective now was the Rio Atrato towards the setting sun, so I left the Magdalena at Puerto Berrio—a terribly unhealthy spot. I will not readily forget an episode near this dreary village of vultures. There being no road of any kind leading away from the town, I had gone for a walk along the railway track and was returning, sweating at every pore, when I saw two peons carrying between them a box slung from a pole. A person in some kind of uniform accompanied them. He was a policeman. As I passed I saw the box was open, and with somewhat of a start realised its nature. Within it, with jaw tied up, with malar bones protruding, with yellow sunken cheeks, lay what had been a man the night before. The very look of him suggested the cause of death. I enquired of the policeman and learned that dysentery had killed him. "Yes," said the official stolidly, "they are always dying here: they die like dogs and are buried like dogs." Is not this sad, with emetine upon the market?

Puerto Berrio

There is, however, neither a hospital nor a doctor at Puerto Berrio, although it has a certain importance and marks the beginning of the railway to Medellin, capital of the Province of Antioquia. There is a gap in the railway, and one rides or drives from station to station. Dr. HENAO, who is in medical charge of the railway itself, is, however, very energetic, and keenly interested in tropical medicine and hygiene.

In the region near Puerto Berrio, various species of Conorhinus bugs are found, and it is possible that CHAGAS's disease exists. At Medellin I was shown a supposed case in a boy of twelve. He was not in a febrile state, so it was no use examining his peripheral blood. I never saw such a mountain of œdema, and personally I am inclined to think he may have been an example of that curious form of nephritis in the young, which was afterwards demonstrated to me at Panama.

Medellin is a very pleasing place, unhappily and quite unnecessarily scourged by enteric. In the hospital here I saw an amazing number of undiagnosed ulcers, chiefly of the legs. There is a fine field for research in this direction. At Medellin I made arrangements for the long journey on mule back across three Cordilleras, across the mighty Cauca River, across lofty and rain-swept paramos, and finally through the dense forests of the Choco to the Rio Atrato.

Medellin

This was certainly the most interesting part of my journey, and I traversed a region little known either to Europeans or to the Colombians themselves. It was only owing to the kindness of Mr. BADIAN, the British Vice-Consul at Medellin, and of Señor DON CARLOS RESTREPO, a well-known Antioquian, that I was able to get proper information and secure a reliable guide.

Journey to the Rio Atrato

I started from the town of Caldas, a picturesque place full of fleas, and journeyed by Amaga and El Provenil to the Cauca valley. The trail wound along bleak mountain flanks, descended into green hollows full of feathery bamboos and singing birds, crossed considerable streams, and, in places, was distinctly dangerous, more especially when one encountered long trains of mules bearing huge planks cut and shaped in the Andean forests. It was the reverse of pleasant to meet such potential battering-rams at a sharp angle, with a river brawling one thousand feet below, and the mountain side towering like a cliff above one.

In the Cauca region, pinta of every kind and colour is exceedingly common. It is said that one species of revenge which is practised is to give your enemy pinta through contact or infected clothes. I saw several cases of the red and black varieties of this intractable disease.

The Cauca, a very fine river, is crossed by ferry, and from there onwards the journey is sufficiently arduous until the upper waters of the Penderisco and the savannah of Urrao in the San Isabella valley are reached.

In the coffee country near Concordia I took several rare Tabanidæ, and I killed a species of coral snake on the savannah. Urrao is an interesting upland town, or rather a church with a town attached, for the new place of worship dominates the landscape. Urrao
The surrounding scenery reminded me of bits of the Clyde valley. It is a great cattle country. Redwater occurs but is not very prevalent, and ticks abound. In the Pavon valley pellagra is common. Maize is the staple food, but it is said to be of good quality. Here are running streams, and Simuliidæ almost certainly occur, though my search for larvæ was futile.

At Urrao I saw a case of very acute and violent mania in a pellagrin. Sanitary conditions are wellnigh non-existent, and, as a result, enteric takes toll of the inhabitants. Everywhere it is the same story – flies, filth and disease. Case of pellagra

The rainy season now began in earnest, and from near Urrao onwards I rode in drenching rain for the most part. One climbed, and better climbed, amongst the greyish-green Andean forests, very still and apparently lifeless, till the Paramo of Sumbacula was reached, in a region of extinct volcanoes. Tabanidæ swarmed upon the road whenever the rain ceased, and I reaped a rich harvest. These mountain Tabanidæ differ from those taken in the Atrato valley.

From the Paramo aforesaid, one descended for a whole day, shrouded in mists and vapour, by a very rough, primitive, precipitous track to the roaring torrent of the Ocaidocito, above which, upon a covered bridge, one spent the night in fair comfort, shrouded in mosquito curtains. Thereafter it was a case of struggling along a muddy and flooded forest path, now through long soaking grass, anon cutting a way with the macheté through tangled bush or dense plantain and rubber groves, meeting with wild and naked Indians, fat and comely folk of a rich bronze colour, decorated with beads, and very pleased to get a few cigarettes; plunging through rapid and rather perilous rivers full of deep pot-holes and swollen like the Spey in spate; catching Tabanids and Chrysops and Dichelacera whenever the sun shone for a space and cheered one up; and sleeping in empty, leaky huts, until at last we halted at Charicha on the banks of the Arquia.

It is to be noted that while the Tabanids attack the fetlocks of an equine, the Chrysops are nearly always to be found about the neck or withers.

From Charicha I descended the Arquia by canoe to its junction with the Atrato, a vast and deep river fringed by the densest tropical growth. There, thanks to the kindness of a Syrian gentleman hailing from Egypt, I was given a room to serve Rio Atrato
as a laboratory. Unhappily it rained wellnigh all day and every day. The river rose and the place became a veritable swamp. There was practically no dry land on which to walk, save for a path along the side of the Arquia. Hence I had to

be content with catching flies and mosquitoes, which abounded, and with making a few blood examinations.

The population is wholly negroid, riddled with syphilis, poverty-stricken and superstitious. I found a case of old nasal myiasis in a negro. It appeared that he had been cured by the use of liquid creosote, originally intended for treating cracks in calves' hoofs. Anyhow, I washed out his nose thoroughly with a mixture of milk and chloroform, but was unable to expel any larvæ. In his blood, however, I found a sharp-tailed filarial embryo, which I recognised as *Microfilaria demarquayi*. This is a new locality for this nematode. The infection was fairly heavy.

The quaint toucans, with their huge yellow bills, are common at the Boca de Arquia, and it is perhaps interesting to note that they swarm with lice, which Dr. GUY MARSHALL informs me belongs to the genus Menopon.[1]

Far up the Atrato the Indians obtain a poison for their blow-pipe arrows, from the venom of a small yellow toad about two inches in length. The venom is procured by hanging the hapless amphibian over a slow fire, when the gland fluid collects upon its cuticle. I was told that a dart thus poisoned caused slight local swelling and rapid death from paralysis. FAUST, of Strasburg, as you probably know, has demonstrated the highly toxic properties of the venom of several species of toad, so I have no reason to disbelieve this story.

Toad poison

After a week in this forsaken solitude, the ancient paddle-steamer passed up river on her way to Quibdo, the capital of the Choco country—some sixty miles south of the Arquia, and with a very evil reputation as regards disease. Malaria and blackwater fever are both rampant.

I embarked on the venerable "Santa Barbara" upon her return, and voyaged to the mouth of the Atrato through a wild forest land, full of egret-haunted swamps and lagoons, the home of the jaguar, the puma and the tapir, and peopled by Indians and negroes. On either hand, far back, were tree-covered slopes and hill ranges; those on the west separating the Atrato from the waters of the Pacific. Towards the mouth of the river I saw many howling monkeys amongst the bushes. Crossing the Gulf of Darien, we reached Turbo, another unhealthy place, and then, with some trepidation, splashed out to the open sea at three miles an hour. Far away we could mark the spot where the unfortunate Scottish colony came to a miserable end, largely through lack of the information which now we happily possess, and, unhappily, so rarely apply in a proper manner.

Gulf of Darien

Touching at Zapote, where the Sinnu River pours a huge volume of water into the Gulf of Morrosquilla, we came finally to the historic Cartagena. Then, on another steamer (calling at the great banana port of Santa Marta, and, remembering that banana bunches often harbour rats), I found myself one morning passing over the spot where lie the bones of FRANCIS DRAKE, and shortly thereafter I was at Colon.

[1] The louse of the toucan has been identified by WATERSTON as *Menacanthus balfouri*, n. sp. A new species of Simulium from this region was named by KNAB *S. sanguineum*.

Panama Canal

Dr. Malcolm Watson dealt so fully with the Canal Zone that it is not necessary to repeat what has been said; and, in any case, Panama no longer possesses the sanitary interest which was such a feature of the excavation days. Still, there is much to be learned at Ancon Hospital, where Dr. Darling, Dr. Connor, Dr. James and others with well-known names, take every trouble not only to give you a good time, but to see that you become familiar with their laboratories (Fig. 37), wards and cases. Dr. Darling has solved most of the Panamian problems, but a few remain. I saw one case, which was said to be an example of mossy foot, under the care of Dr. Caldwell in Panama City (Fig. 38).

Canal zone

Fig. 37. Dr. Darling's Laboratory, Ancon Hospital, Panama Canal Zone

Fig. 38.—Case of Mossy Foot, Santo Tomas Hospital, Panama
From a Photograph by Dr. Caldwell

Mossy foot

Syphilis

The cause of mossy foot is still unknown. The condition is not mycetoma, which it resembles.[1] Look at this truly appalling wreck of an Indian youth of 28 years, the victim of untreated congenital syphilis (Fig. 39)! Dr. CALDWELL told me that on admission he was a huge scab. Salvarsan worked wonders, but it could not perform miracles: hence this bone absorption, these scars and deformities.

Nephritis

The nephritis of the young negro is a curious condition. Dr. DEERS believes it is due to toxic absorption from the bowel, the result of carbohydrate fermentation, and gives his patients plenty of butcher's meat with, he assures me, excellent results.

It is truly wonderful what the Americans have done upon the Isthmus, but there are signs of slackening, as some of their doctors admit, and it is earnestly to be hoped that the sanitary banner will be kept flying for all time. It must not be forgotten that the French did a great deal also in the way of hospital construction, but they were too early upon the scene, and paid a dreadful penalty for ignorance.

JAMAICA

Jamaica

Jamaica is surely one of the most beautiful spots on earth, and yet observe what occurs there! Here is a woman with a gaping hole where her nose should be, sightless optics, and a terrible scarring upon the neck and shoulder! All this is probably the result of yaws (Fig. 40).

Enteric is common in Kingston, and they are still worrying about the cause thereof. Is it water? Is it privy-pits plus flies? Is it a question of carriers and contact?

Then there is the vomiting sickness, a problem yet unsolved, despite the labours of Dr. HAROLD SCOTT, SEIDELIN and others.[2]

I found Major HARRISON investigating another problem, *i.e.*, the nature of the endemic neuritis of Jamaica, which is quite distinct from beri-beri, and in which the special senses are apt to be affected. Thanks to Dr. ERRINGTON KER, I saw a good deal of the island, and many cases of disease, among them one of cholecystitis, very closely simulating yellow fever. Why should a sturdy negro boy get rickets, and why, as Dr. WILLIAMS told me, do pellagrins in the asylum improve on a banana diet? Why, also, do patients *in* the asylum acquire pellagra?[3]

CUBA

Cuba

Dr. MACDONALD, now busy at ankylostomiasis prevention in Grenada, gave me an insight into his sanitary problems, before I embarked on yet another steamer, and set sail for the wonderful harbour of Santiago de Cuba. Thence a train takes one right up the middle of the pearl of the Antilles. Under American influence sanitary measures are not lacking, as witness the small boy at Camaguay Station, with his sweetstuffs shrouded in muslin (Fig. 41).

Havana

AGRAMONTE and GUITERAS are names wherewith to conjure in the fine city of Havana, where I had the good fortune to see some cases of plague—happily for them, convalescent. I also visited the waterworks, which are one of the sanitary features of Cuba's capital.

[1] Dr. WOLFERSTAN THOMAS, of Manaos, has discovered that it is a leishmaniasis.

[2] Since proved by Dr. SCOTT to be ackee poisoning, ackee being the fruit of *Blighia sapida*.

[3] If the recent Egyptian Pellagra Commission is correct in its findings, the cause may be found in a deficiency of biological protein in the diet.

FIG. 39.—CASE OF CONGENITAL SYPHILIS AND OSTEOMALACIA IN A PANAMAN, AGED 28 YEARS. SANTO TOMAS HOSPITAL, PANAMÁ.
From a Photograph by Dr. CALDWELL

FIG. 40.—CASE OF FACIAL ULCERATION AND SCARRING, POSSIBLY THE RESULT OF YAWS, KINGSTON, JAMAICA.
The nasal cavity is covered by a dressing.

FIG. 41.—BOY SELLING FLY PROTECTED SWEETSTUFFS AT CAMAGUAY RAILWAY STATION, CUBA

Here, I think, we may call a halt, for we are practically out of the Tropics, and between Havana and New York there remained only Nassau, in the outlying Bahamas. It is impossible, with the space at my disposal, to deal fully with everything that came under my notice during a tour that lasted six months.

I have only been able to give you a mere outline of my journey, but I think I have said enough to show that these distant lands, so rich, for the most part, in their flora and fauna, are also, in many instances, rich in pathological problems, and in those conditions which destroy alike the white man and the black.

Happily, most of them are preventable; unhappily, many of them are not prevented. The means which should be taken to do so constitute the greatest problem of all, and yet very often it is a problem capable of comparatively easy and speedy solution. Much has doubtless been done where the British and American flags fly. At this time we remember, surely with sorrow and regret, how within a very short space of years 90,000 British troops perished in the West Indies, almost wholly from disease. An army disappeared. That could scarcely happen again, but even under the Union Jack there is need for a quickening of dry bones, for men to be up and doing, for sanitary progress, sanitary reform and medical research. Still more is all this required in the two large Republics with which I have dealt, which are countries of great potential wealth, and of very considerable importance in the world of commerce.

Preventable disease

We live in expectation of the day when mystery will yield to knowledge, and when knowledge will be applied for human comfort and salvation.

PREVENTIVE INOCULATION AGAINST TYPHOID AND CHOLERA

I HAVE been asked to tell you[1] something this afternoon about certain of the bacteriological methods in general use for protecting the human organism against typhoid fever and cholera, and I will endeavour by graphic means to enable the lay members of the audience to obtain a grasp of the principles underlying these measures, and of the bacteriological technique employed.

Before discussing prophylactic inoculation against these two dread diseases, it would seem advisable, with such an audience as I see before me, to say a little about the diseases themselves, and we will begin with typhoid fever.

Even nowadays one is sometimes asked if typhoid and enteric fever are the same thing. The reply is, of course, in the affirmative. The word typhoid comes from the Greek *typhos*, meaning stupor; while enteric is employed as indicating the region on which the stress of the disease falls most heavily.

At the outset, I would remark that typhoid in England in time of peace and under normal conditions is a very different thing from typhoid in time of war, more especially if that war is waged under tropical or semi-tropical conditions. All the same, it is ever a serious and treacherous disease, and occasionally appears in strange guises.

Typhoid in war

I remember well the first case of typhoid I ever saw. It was in a room behind a dairy, when I was a medical student doing dispensary work in Edinburgh. This dispensary practice for students is very valuable, initiating them into the mysteries of medical life. The fact that they have to pay for the privilege and get no fees, does not, unhappily, wholly differentiate it from the conditions under which they have to labour when full-fledged. But about the case. Men are made to hunt in couples, and the student who was with me and who is now in an Asylum—as its Medical Superintendent, be it noted—was filled with a pride equal to my own, for we diagnosed the case almost at once. Small credit to us. It was a typical, mild case in a child, dangerous only by reason of its surroundings. Thereafter I saw much typhoid in a large fever hospital, and became familiar with most of its phases and with that peculiar odour which accompanies it, and which, though not so distinctive as that of typhus, is yet sufficiently remarkable.

Typhoid in civil life

As a rule, however, one saw typhoid under good conditions, in decent houses, in clean airy wards, well nursed and well starved!

[1] The Research Defence Society.

Typhoid in the Boer War

What a difference to the conditions in South Africa, where, remember, during the Boer War, over 8000 men fell victims to it (Figs. 42 and 43). There one saw the disease at its worst, witnessed wretched, stuporous patients in stinking khaki taken from trains and ambulance waggons, heard the droning buzz of the accompanying cohorts of filthy flies, saw peeling and crusted lips, teeth coated with sordes, and tongues dry as those of parrots. One witnessed, all too frequently, the horror of excessive meteorism, the shock of haemorrhage, the tragedy of perforation.

FIG. 42 GRAVES OF THOSE WHO DIED OF DISEASE, CHIEFLY ENTERIC FEVER, DURING THE BOER WAR, BLOEMFONTEIN

A ghoul

I am not going to dwell over-long on this painful aspect of the subject, but I want you to get some idea of what our men are being saved from at the Front, and I want to relate a curious incident which came under my notice. Attached to the hospital in which I was serving there was a curious ghoul of a man—one of the Militia Medical Staff, who had charge of the sad little mortuary tents and of the long rows of graves in the local cemetery. He was accustomed to select verses at random from Holy Writ and scribble them upon the coffin lids, until the Roman Catholic chaplain, finding some of his flock being buried under heretical inscriptions, complained and had the practice stopped. As a rule, his verses, chosen haphazard, had no bearing on the case, but I remember how once

he hit the mark, albeit quite unintentionally. A fine, lusty young fellow, in apparently good condition, suddenly grew worse shortly after being carried into the marquee from the hospital train. His symptoms were somewhat obscure, but he rapidly sank, and afterwards we learned that his death was due to intestinal perforation, doubtless the result of the jolting in the train and shifting to and from the stretchers. On his coffin the ghoul, strangely inspired, inscribed these words: "Thou tookest away my strength on my journey." Case of perforation

FIG. 43.—MONUMENT IN THE MILITARY CEMETERY, BLOEMFONTEIN TO THOSE DEAD OF DISEASE DURING THE BOER WAR

I have often thought that the subject of fever is somewhat neglected by our artists and our poets. As regards the latter, only a MILTON in the loftiest of blank verse could do full justice to the fury of the acute fever fit and the dull, drunken lethargy, or low, muttering delirium of prolonged pyrexia; but you will remember KIPLING'S lines in his "Dirge of Dead Sisters," a fine tribute to the noblest of women:— Pyrexia

"When the days were torments and the nights were clouded terror,
When the Powers of Darkness had dominion on our soul—
When we fled consuming through the Seven Hells of fever,
These put out their hands to us and healed and made us whole."

Now have you ever thought what he means? What are the Seven Hells of fever? I doubt if he knew himself, and yet, if you think of it, he was near the mark. We may, without being far wrong, record them as—

Heat	Pain
Restlessness	Thirst
Delirium	Insomnia

and Fear.

That men stricken with typhoid may die mainly of fear I firmly believe. I have seen such a case, a case in which a little learning proved a dangerous thing, but where familiarity assuredly did not breed contempt.

The cause of the disease and methods of fighting it

I need not tell you how typhoid, which is due to a small and very active rod-like bacillus furnished with flagella as a Roman galley was with oars, is transmitted. Put briefly and alliteratively, it is by careless carriers, contact cases (chiefly cooks), drains, dairies, dirty drinking-water, the dust of dried dejecta and the repulsive regurgitation, dangerous droppings and filthy feet of faecal-feeding flies fouling food. Personal contact and "carriers" play a very important part, but this aspect of the subject need not detain us, and we pass at once to our main theme.

To understand why vaccination protects from typhoid infection we must consider the problem of immunity.

At this time we may appropriately compare the human body to an invaded country in which stands a fortress. What of the latter's defence? How may its garrison be reinforced? That is the question with which we are faced, for so long as the fortress holds out, the country, like gallant Belgium, remains unconquered.

From the general point of view you may aid the defence:—

1. By frequent reinforcements of allies which powerfully combat the enemy, as, for example, doses of quinine in malaria; or by munitions, which merely hearten the garrison and repair losses, as, for example, the exhibition of stimulants and nourishment.

2. You may save the defence from the development of an attack by getting an ally to strike a blow at the enemy immediately upon invasion, just as the Russians invaded East Prussia while the German hosts surged into France, and just as you cauterise the bite of a mad dog—in other words, surgical interference.

3. You may reinforce by stiffening with veterans; that is to say, you strengthen the defence by pouring in a portion of another garrison which has successfully encountered and overcome the enemy. Now this is what is called the production of passive immunity, and it is what occurs when you employ serum treatment, as for diphtheria and tetanus, where the blood serum of an animal which has overcome an artificial infection is used with marked success to treat the human patient. We will say no more about it at present, but it must be clearly distinguished from the next item, which is:—

Passive and active immunity

4. Active immunity, the process with which we are concerned in our consideration of enteric prophylaxis.

In the case of inoculation against typhoid fever, the enemy or typhoid bacillus, and its toxins or poisons, are purposely allowed to invade the country in small

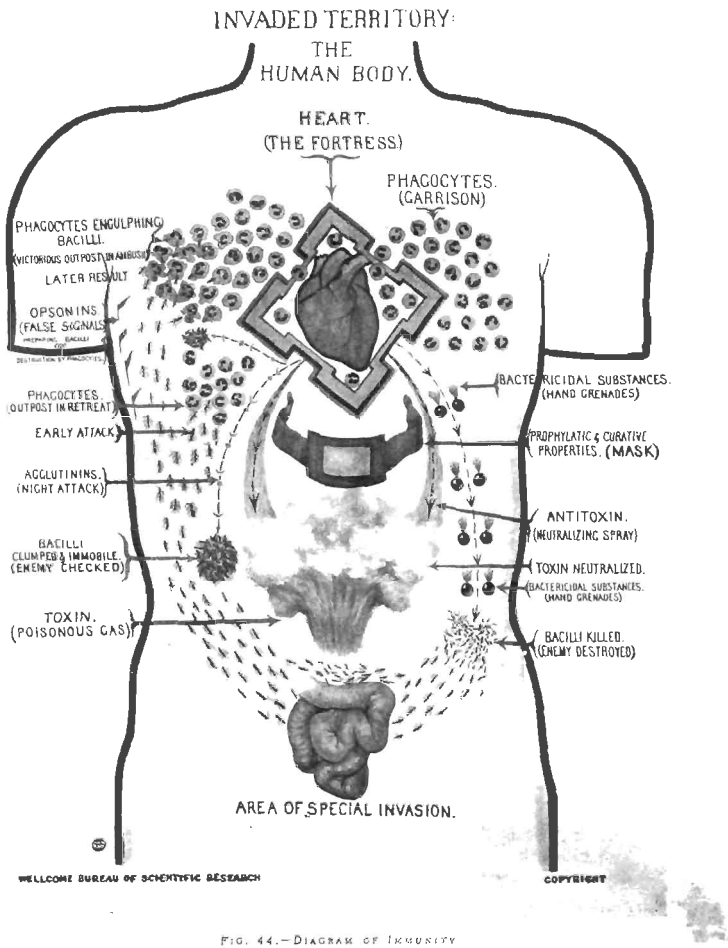


FIG. 44.—DIAGRAM OF IMMUNITY

detachments, wherein they are overpowered by the defence, and, as a result, the latter benefits by having conferred upon it an immunity from further, and possibly more severe, attacks. This is the process of vaccination, familiar also, though in a different form, in our campaign against smallpox, and bitterly opposed by certain misguided people who would put a foolish and unnecessary consideration for the ignorant individual before the good of the community and the welfare of humanity.

Now how is this strengthening of the complex human garrison brought about? It is not very easy to understand, but it is to some extent capable of explanation by the use of a military analogy (*see* Fig. 44, *page* 75).

Military analogy

Generally speaking, as soon as the enemy gains a footing in the country, outposts of the garrison commence to attack and destroy some of them. These outposts are certain of the white blood corpuscles which are termed phagocytes. Finding themselves successful they are stimulated to greater efforts, and others join their ranks until regular battalions of trained outposts are ready to deal with the foe. In the presence of such a powerful adversary as the typhoid bacillus, however, it would seem that at first the outposts may be driven back and find their chief use later on in trapping a weakened and deluded enemy or, as a sanitary corps, in removing the debris of the battlefield. In addition, however, other processes go on.

Anti-toxins

We have spoken of the toxins or poisons produced by the enemy wherever he lives and flourishes: it may be inside the disputed territory or outside it. Now these toxins may very well be compared to the poisonous gases used in Flanders. They have to be met, and are met, by chemical means, and here it is the blood serum plays a part, for it becomes charged with substances produced in divers ways and which protect against the poisons, like the hyposulphite on the gas mask; others which are actually curative, and yet others which specially counteract the poisons, anti-toxins as they are called, just as it may be possible to spray some substance into gas fumes which will form an inert body with the chlorine or bromine and render it harmless. But this is not all. Night attacks are known to limit an enemy's mobility and cause him to concentrate, without necessarily destroying him. In addition to the properties just mentioned, the blood serum becomes

Agglutinins

furnished with substances called agglutinins, which cause the separate bacilli to run together into little groups and lose their very active movements, without actually killing them. This peculiar property acquired by the serum can be demonstrated outside the body and so is of value as a clinical test, its presence enabling us in many cases to say that a patient is suffering, or has suffered, from typhoid fever. Further, so great are the powers of the garrison, that some of the protective substances of the blood serum can also

Bacteri-cidal substances

act upon the enemy itself, that is to say upon the bacilli, not the toxins. They play much the same part as the phagocytes, though they slay their foes in a different manner. They may indeed be likened to hand grenades. Lastly, so cunning is the defence, that it has a way of insidiously weakening or deceiving the enemy and so rendering the latter an easy prey for the outposts, which, as you will remember, were at first driven back and which we may imagine to have been all this time lying in ambush and waiting for their chance.

Opsonins

In other words, special bodies called opsonins are formed whose duty it is to prepare the micro-organisms for ingestion by the leucocytes. We may not inaptly compare these to false signals or reports which lead the foe into the arms or pseudopodia of the outposts.

Thus the sera of immunised animals may exhibit one or more or all of the following, each independent of the other and occurring in different degrees of strength :—

1. Prophylactic and therapeutic properties. . Mask
2. Antitoxic properties ..... Gas sprays
3. Agglutinating properties ..... Night attacks
4. Bactericidal properties ..... Hand grenades
5. Opsonic properties ..... False signals and reports

It is of interest to our Society to know that all the preliminary work which led up to typhoid vaccination was dependent upon careful experiments upon animals. Fortunately, our knowledge is now so advanced that in the ordinary preparation of typhoid vaccine or, as it is better called, emulsion, it is no longer necessary to employ animals *at all*; but I may here tell you that such experimentation is giving us new and valuable means for dealing with death and disease, as, for example, the introduction of the new diagnostic "skin tests," as they are called.

"Skin test"

You may have heard of the "skin test" in tuberculosis, the von Pirquet reaction, and now these tests are being utilised in streptothricosis, in diphtheria, in smallpox, in syphilis and, most recently of all, in typhoid.

A substance called "typhoidin" is used. It consists of a culture of the *B. typhosus* in glycerine broth suitably treated by evaporation. A small quantity is rubbed into the skin. If a positive cutaneous reaction results it is said that we may be almost certain that the patient has had typhoid or that he has been efficiently vaccinated against it. Hence this test, if its value is fully confirmed, enables us within a few hours to say whether any given person should be vaccinated against enteric. It is so delicate that a positive result has actually been obtained 41 years after infection. The Americans, GAY and FORCE, who introduced it, state that it is reliable in 95 per cent. of cases of recovered typhoid, and occurs in only about 11 per cent. of persons giving no history of typhoid or typhoid immunisation. *Such persons may have had typhoid without knowing it—by no means* an impossible occurrence. According to GAY and FORCE, this skin reaction is simpler and more reliable than the old Widal agglutination test. Time and experience will show if they are correct.[1]

Artificial immunisation

We have now considered what typhoid is, the principles of immunity, and the agglutination and typhoidin tests. How, then, do we imitate the protective action of typhoid? How do we immunise the human body against it? Between 20 and 30 different methods have been described and advocated—a sure sign that perfection has not yet been attained—an incentive to further effort.

I will not weary you with the history of the research, which began in 1887, and will doubtless end when typhoid ends. It will be sufficient to indicate the usual technique and to speak of some of the most recent modifications.

WRIGHT'S method, improved by LEISHMAN and HARRISON as the result of long experience, still holds the field in this country. You isolate your bacillus from a case of typhoid fever, you grow it for a time in a suitable medium, where it reproduces itself to an

[1] The typhoid "skin test" does not possess the practical value of the somewhat similar "*Schick*" *reaction for diphtheria.*

enormous extent and manufactures its toxins. At a certain stage in its growth you kill it by means of heat. The dead bacilli and the medium in which it grew and produced its toxins constitute your emulsion in bulk. This must be carefully tested for sterility, and its strength, *i.e.*, the number of bacilli it contains, estimated and adjusted (standardisation).

Preparation of anti-typhoid vaccine

A preservative is then added to it, and, after being suitably bottled, it is ready for injection in whatever dosage and by whatever method is deemed best. It is customary to give two doses subcutaneously at an interval of 10 days—the first containing 500 million and the second 1000 million bacilli—the strain used being one of low virulence. Such is the bare outline of the method of "whole" cultures. As LELEAN points out, it is useful to remind those who shudder at the thought of becoming a receptacle for millions of germs, that 1000 million of them only weigh $\frac{1}{4000}$th of a grain.

This, then, is the usual method of killed cultures; but you can, if you like, kill your cultures by other means than heat. Extracts of the bacilli have also been used; living cultures have been employed, as they have a superior immunising power and by many are regarded as safe; and, finally, a method has come into vogue whereby living bacilli are soaked in a highly immune serum, then killed by heat and used as a vaccine. Such soaking is termed "sensitisation," and it is supposed to cause very little local reaction after the administration of the vaccine, and, while conferring a good and enduring active immunity, to give rise to an immediate, though transitory, passive immunity, which, as you will see in a moment, has, according to certain observers, a distinct value.

Negative phase

WRIGHT showed, so far as laboratory work is concerned, that immediately after the use of the ordinary vaccine the patient's resistance to typhoid is lowered for a few days—there is a negative phase, during which the garrison is not at its best. Hence it was stated that it is not advisable to vaccinate against typhoid during an epidemic or in endemic centres of the disease, for, being more liable, the patient may get a true typhoid infection before his immunity is established. "Tide over this short negative phase by establishing an immediate passive immunity with your sensitised vaccine," say the advocates of this method, and you do away with practically the only scientific drawback to typhoid vaccination.

It sounds very beautiful in theory, but those best qualified to judge do not consider that a negative phase need be seriously taken into account in the case of typhoid, and, in any case, do not believe that sensitisation of the vaccine confers any real benefit upon it or the patient, at least when it is used prophylactically. It is, however, possible that this measure will be found useful when the typhoid emulsion is employed, as it can be and is, for the *treatment* of cases. It may then save the wearied body some of the labour of producing anti-toxin: but this carries us beyond the scope of our demonstration.

Value of inoculation

As to the value of prophylactic inoculation there can be no reasonable doubt. The statistics, in addition to showing the prophylactic power of the vaccine, indicate that the vaccinated, even if they do contract the disease, are much less likely to die.[1] At the same time, in submitting statistical proof, we must be careful to see that it is based on adequate figures and that proper controls are instituted; while, in every case, due credit must be given to general sanitary efforts and to all other conditions which

[1] Fresh proof in this direction has been obtained during the late war, as a result of experience, on a large scale, with the triple vaccine protecting against typhoid and the paratyphoid fevers A and B.

may have a bearing on the results obtained. In this respect a recent paper by Major GREENWOOD and Dr. YULE merits careful attention, although to many the mathematical part will prove a stumbling block.

How long does the protection last? The typhoidin test may give us more definite information, but HARRISON and others have shown that bactericidal and agglutinating properties may persist for four years. It would seem desirable, however, to repeat the vaccinating inoculations at shorter intervals in order to maintain and re-enforce the immunity. This is also true of cholera vaccination, about which little need be said. The principles are the same, though the organism, as you have seen, is different. The disease is wholly distinct from typhoid, but the shock of its sudden onset, the horror of rapid desiccation—for the patient shrivels and mummifies before your eyes—and the tragedy of the husky voice, make it more terrible than the continued fever.

Duration of protection afforded by vaccination

No wonder cholera, the water-borne, the disease also of contaminated food and flies, is dreaded as are few of the other epidemic disorders. In no disease is prevention more important, for cholera is a question of minutes and of hours. Hence vaccination against it, as practised notably by HAFFKINE in India, will, I think, prove a boon and a blessing, although it is yet in its infancy and its full value has still to be disclosed. I will *only mention* the results *obtained* by SAVAS *in the war between Greece and* Bulgaria, when he used a vaccine made from cholera vibrios, the virulence of which had been artificially raised.

Anti-cholera vaccine

As he says, the method has received its baptism of fire and is chiefly applicable, so far as Europe is concerned, in time of war, when the danger of spread is magnified and sanitary measures are apt to fail. Unfortunately, however, his statistics leave room for doubt, save in the case of the Sanitary Corps, the members of which were almost certainly exposed to greater risks than the ordinary combatants, and yet, presumably because they had been efficiently protected by vaccination, suffered in a much smaller degree. It must be remembered, however, that they probably took better care of themselves than *the ordinary soldier.*[1]

Whatever criticisms may be levelled at the conduct of the present war, and there are always folk ready to criticise, I believe there will be nothing but praise for the splendid work of the Royal Army Medical Corps in France and Flanders, the only Fronts I have so far visited. Further, when the record is written, the chief glory of that Corps will be found to lie in the wisdom and thoroughness of its preventive measures in these war areas.

When I was in Natal, in 1900, I had the privilege of assisting Dr. WATKINS-PITCHFORD in his work on typhoid fever and in the collection of his statistics. He had to incubate his typhoid cultures, and how do you think he managed it? By sleeping with them tucked away in his pyjamas!

What a difference to the scene I witnessed at the Front early in January. There I found Dr. ROWLAND, of the Lister Institute, busy at vaccine and other research

[1] Cholera vaccine appears certainly to have been of value during the late war, but reliable statistics are not yet available. The dose has been greatly increased, as much as 15,000 million bacilli being now given as against 3000 million formerly. Evidence, both of its hygienic and economic value, is now being received from India.

Advance in facilities for investigators

in a beautifully-equipped motor laboratory, and doing work of the utmost value. He had already found several "carrier" cases, each one capable of spreading disease and death on a large scale. Indeed, the history of one civilian case showed that the unfortunate woman had unwittingly caused the deaths of most of the members of her household.

The responsibility of the individual

Consider how important is this aspect of the case. Each man who refuses to be vaccinated is not only a danger to himself but to his comrades, to his regiment, to the British Army, and even to the Empire he serves.[1] In the light of our present knowledge, and remembering that anti-typhoid inoculation, properly carried out, is a harmless procedure, those who persuade him to go unvaccinated incur very grave responsibilities and are, to put it plainly, traitors to their country. I fear, however, that such is their state of mind that if one rose from the dead to speak to them they would not be convinced, and probably they would listen unmoved to this true tale which I heard when I was in France.

A young soldier lay very dangerously ill with typhoid. Death stared him in the face. His powers seemed failing, but he was able to beckon the nurse to his side. It was clear he wished to say something to her. She bent to catch his feeble voice, and this is what she heard in faint and broken utterance:—

"Tell them it was my own fault, Sister; I would not be inoculated."

[1] Even under ordinary conditions of life it is highly desirable that young adults proceeding to tropical countries should undergo preventive inoculation for the typhoid and paratyphoid fevers.

THE MEDICAL ENTOMOLOGY OF SALONICA

At the outset I would ask you[1] kindly to disabuse your minds of any idea that I claim to be an expert entomologist. Indeed, I am only sorry that Major AUSTEN of the British Museum, now in Egypt, is not here to speak to you in my place. In his absence, however, I must do my best, and I can at least claim to have suffered many things from many insects. To use a time-honoured sporting phrase, my "claret has been tapped" by sero0t flies on the Upper Nile, by beautiful green and vicious Lepidoselaga on the Orinoco, Magdalena and Atrato Rivers, and by Mosquitoes, Ceratopogons, Simuliidæ, Stomoxidæ, Phlebotomus and a host of other flies in several parts of the old and the new world. Hence, I feel I can address you with some confidence. Further, I intend, this afternoon, to confine myself more or less strictly to Medical Entomology, and, as I have myself suffered from malaria, phlebotomus fever and paratyphoid, the last-named almost certainly the result of fly infection, I can claim to have some practical experience of my subject.

WINGED PESTS

It seems to me that the most simple way of approaching the medical entomology of Salonica is to divide its insect pests into the winged and the wingless forms. Some may think it is rather presumptuous on my part to attempt to deal with the insect fauna of a district to which I was a stranger three weeks ago, but, after all, there is no need to enter into minute details, and, so far as I have seen, the pernicious insects of Salonica do not greatly differ from those of other parts of Southern Europe with which I am to some extent familiar. Moreover, I am indebted to Mr. ANDERSON of the 20th Stationary Hospital both for information and some specimens, while I have been doing a little collecting as occasion offered. At least, like yourselves, I am only too well acquainted with the first of the winged insects I will bring to your notice, namely, the House Fly, *Musca domestica* (Fig. 45).

Winged pests

Fig. 45.—*Musca domestica*
The common house fly

Our Canadian friends call this fly, with good reason, the Typhoid Fly, but it might just as well be termed the Paratyphoid Fly, or the Dysentery Fly, or the Cholera Fly, or the Helminth Fly, or possibly even the P.U.O. Fly, though the evidence before us at present does not point in this direction. Now the house fly, though useful enough as a scavenger, speedily becomes a nuisance and a danger when it invades the habitations

The house fly

[1] The Salonica Medical Society

or camps of man. It is one of the most fecund of animals. Just think what a single female can accomplish! She lays 120 eggs in one batch, and during the year she may lay four such batches. Taking only one batch, let us say that half the flies that hatch out, *i.e.* 60, are females. Provided the progeny of these 60 females and that of succeeding generations all reach maturity, a state of things which, let us thank God, never occurs, the original mother fly would in six months become the ancestress of no less than 5,598,720,000,000 adult flies. Consider what this means, and, if your arithmetical knowledge suffices, make the calculation for all four batches. You may be able to do so, but no human mind can adequately picture the result. This is one reason why delay in fly preventive measures is fatal. It is not, however, a reason for sitting with folded hands and saying that fly prevention is a hopeless task. Fly *extermination* is hopeless. Fly *prevention*, within certain limits, is not only possible but essential.

Fecundity of fly

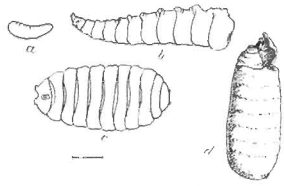


Fig. 46.—*Musca domestica*

Now all these flies come from eggs. Where are these eggs laid? In filth of some sort or other, and usually in *local filth*. By the flies of their own breeding ye shall know the dirty and the careless unit. In this country there are two main sources of flies—the one Human Excrement, and the other Horse Manure. I have not been here long enough to say which is the more common at present, but, as the summer heat increases, I believe the former will infallibly prove to be the chief source of flies. In any case, it is, of course, the more dangerous. Apart from any question of faulty military sanitation, we must remember that just as the wind bloweth where it listeth so does the itinerant native ease himself where and when it pleases him. If you have any doubts as regards this statement, go and walk about the marshes bordering the Monastir Road! You all know that the fly egg becomes a larva, that the larva changes to a pupa, and that from the pupa the adult emerges; but I wonder how many are familiar with the white, sticky, shiny, cigar-shaped eggs, are acquainted with the cream-coloured footless maggots, know the brown pupal cases or puparia, and have seen the young adults with unexpanded wings emerging from their breeding-places and looking, at a short distance, for all the world like little spiders (Figs. 46 and 47). It is the duty of every medical officer to acquaint himself with the appearances of every stage in the life history of his deadly enemy, the fly. I have said I am not going much into entomological detail to-day, but it is necessary to remember that, unlike the adult fly, the larva loves the darkness rather than the light, although its work is beneficial; and that under the most favourable conditions of temperature and food supply, the life-cycle from the egg to the adult takes about eight or ten days for its accomplishment. While this is true as a general rule, I must tell you that some experiments carried out last summer in

Life history

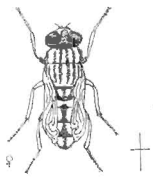


Fig. 47.—*Musca domestica*
Just emerged from the pupal case. Note the wings, as yet unexpanded, folded and crumpled on the back of the insect

Khartoum showed that the whole period of development might be as short as five days. Taking all kinds of conditions into consideration, we may say that the period varies from five days to as much as eight weeks. As soon as fly larvæ have fed and become full-grown, they migrate from their source of food, and, wherever possible, work their way down into the subjacent and surrounding earth where they proceed to pupate. In loose sand they may reach astonishing depths—even six feet and more having been recorded. The pupal stage itself lasts, as a rule, from three to five days, and then the fly escapes from the pupal case by pushing off the anterior end of the latter by means of its inflated frontal sack or ptilinum, a vestige of which remains on the head of the adult fly.

Fig. 48.—*Musca domestica*. Foot, showing hairs on which bacteria, etc., lodge.

As house flies breed in filth, a certain proportion of them actually begin life infected, and a consideration of the adult insect shows how admirably adapted it is for the conveyance of disease germs. I take it you are all familiar with the external anatomy of the house fly: with its sucking proboscis, its hairy body, its hairier legs with their claws and pulvilli or membranous pads which are covered with secreting hairs so that the fly can walk upside down on the most polished of surfaces (Fig. 48). You know also that on its body, wings, legs and feet the fly can and does carry pathogenic bacteria which it may transfer to foodstuffs with disastrous effects. Of more importance to us at the present moment is its internal anatomy, for much of the damage which a fly does is due to its habit of spending the livelong day vomiting and defecating. This is not a pleasant thought, but it has to be faced.

Habits

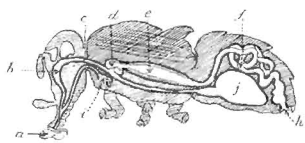


Fig. 49.—*Musca domestica*. Internal anatomy.

Well, the fly has a mouth, a cylindrical tube occupying the first half of the proboscis and passing into the sucking organ or pharynx. From the latter the œsophagus extends backwards, bifurcates and communicates with the crop and with the proventriculus. The latter runs to the chyle stomach from which springs the intestine, passing on into the rectum which ends in the anus (Fig. 49). Now, before feeding, the fly must imbibe liquid, and its diet, like that of a typhoid case, is fluid. At first this fluid passes into the crop, and when this is distended or, if the fly is disturbed before distension has occurred, it finds its way into the proventriculus which acts as a kind of mixing tank to prepare an emulsion suitable to the fly's stomach. After a meal, regurgitation takes place, and the fly spots with which you are familiar are due in part to matter

Internal anatomy

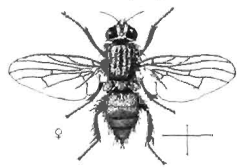


Fig. 50.—*Fannia canicularis*. The latrine fly.

excreted from the anus and in part to vomit. So much for the fly's internal arrangements.

Dysentery

I want to-day specially to direct your attention to what happens in the case of amœbic dysentery as recently worked out by Lieut.-Colonel WENYON and Captain O'CONNOR, R.A.M.C., at the Orwa-el-Waska Hospital in Alexandria, not only for *Musca domestica*, but for *Fannia canicularis*, the little house fly or latrine fly, and for both Green-bottles and Blue-bottles. As you know, *Entamœba histolytica* produces in the human intestine cysts with transparent capsules and four nuclei which are passed in large numbers in the fæces of cases of untreated or improperly treated dysentery patients or convalescents. It has now been demonstrated for the first time what really happens when flies take up these cysts. Within 20 or 30 minutes of feeding on human fæces, and in some cases even five minutes after such a feed, flies begin to deposit droplets of liquid fæces, and in these the *unaltered* and *living* cysts can be seen if the fæces on which the fly has been feeding contained them in the first instance. Within a few hours thousands of cysts may pass through a single fly, and if the fly finds its way to food, as it so commonly does, they are deposited on the latter, and the way made easy for a dysenteric attack.

So far there is no evidence that flies regurgitate the cysts, and it is unlikely that they are carried on the outside of the fly, for flies clean themselves after feeding on fæces and do not move far until they have got rid of most of the foul material adhering to them. What remains soon dries and, as a result, the cysts die. As regards bacillary dysentery let us only note that dysentery bacilli have been recovered from flies two or three days after their absorption by these insects.

Typhoid

The rôle of the fly in spreading typhoid bacilli and the vibrios of cholera is, I take it, sufficiently well known to you.

Cholera

Cholera vibrios have been found in the fæces of flies for from 24 to 36 hours after infection.

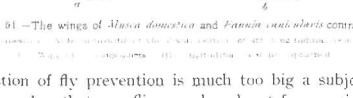


Fig. 61.—The wings of *Musca domestica* and *Fannia canicularis* contrasted

The whole question of fly prevention is much too big a subject for me to consider fully to-day, but remember that 500 flies can breed out from a single deposit of human fæces, and that 4000 of these pests can emerge from 1/6th of a cubic foot of sewage trench ground. Remember, further, that, even in a temperate climate, horse manure not over 24 hours old produces, if left alone during the warm months, an average of 10,000 to 12,000 flies per cubic metre, and thus one horse may, in a manner, during the summer become the parent of from 40,000 to 50,000 flies a month. The temperature of Salonica is just about right for this kind of performance at present, so, Gentlemen, let us be up and doing, for once the vicious circle is established the difficulties multiply enormously.

Anti-fly measures

To save time, I exhibit photographs (*see* Fig. 79, *page* 101; Fig. 83, *page* 105; Fig. 85, *page* 106; Fig. 90, *page* 109; Fig. 91, *page* 110; Fig. 95, *page* 113) *showing methods of protecting latrines, etc., from flies, but all I would say about the matter is that when you cannot deal with all the breeding-places, as, in a locality like the*

Salonica area with its deposits of human ordure here, there and everywhere, you must deal with adult flies. You all know about sodium arsenite, and formalin, and solution "C," and flaming, and the use of mosquito nets as drag nets in mess huts and tents, and the use of fish-netting to keep flies out of tents and buildings, and fumigants and tanglefoot, and small traps used, as I think, quite erroneously indoors; but I would ask you to note the use of large and simple traps placed outside cook-houses and messes, which trap flies in thousands, and certainly serve to lessen the fly population and to slay infected Muscidæ. These traps, if properly operated, have been proved to free such places from flies to a very considerable extent. Flies do not, as a rule, travel far, but they can easily cover half-a-mile, and it is known that they can traverse a mile with a favouring breeze.

Lesser house fly

So much for the house fly. After birth it does not grow, and hence when you see a so-called small fly it is either a house fly which has been stunted in its growth during its larval stage, or it is a different species, *F. canicularis* (*see* Fig. 50, *page* 83) or *F. scalaris*, the latrine fly, which not only does all that the house fly does, but is known to cause a form of intestinal and even of urethral myiasis. The adult is very like the house fly, but is smaller and more slender, and can readily be distinguished by the fact that the fourth longitudinal vein of the wing does not bend upwards towards the third vein, but runs straight to the edge of the wing (Fig. 51). The larva of *Fannia*, whether *canicularis* or *scalaris*, is quite different from that of the house fly, for it possesses a number of spinous processes which give it a curious and almost feathered aspect (Fig. 52). Fannia does not come much into houses, but it frequents tents and marquees. In the earlier part of last summer it was much the more common fly in Mudros and apparently on the Gallipoli Peninsula, but, so far as I have seen, it is not so much in evidence about Salonica. It is to be slain wherever and whenever found. Many of you must have cast a disgusted eye at deposits of human faeces. Have you ever noticed that it was sometimes difficult to see them until it was almost too late by reason of the brilliant green flies clustering upon them and feeding greedily upon them? These are species of Lucilia of which I show you specimens. *Lucilia cæsar* is the commonest species (Fig. 53). It is an excellent scavenger, but unhappily does not confine itself to filth. Therefore, again, our motto must be "Away with it"! The same is true of the familiar blow-flies or blue-bottles, the Calliphora, many of them with red heads and all possessing an aggressive buzz (Fig. 54). They do not seem to be quite so common in the Salonica area as the Lucilia flies.

Fig. 52.—*Fannia canicularis*
Larva

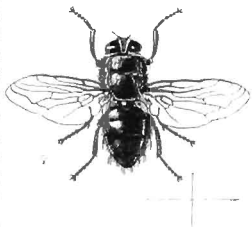


Fig. 53. *Lucilia cæsar*
The "Green-bottle"

Green- and Blue-bottles

Fig. 54.—*Calliphora erythrocephala*
The "Blue bottle"

Our next fly is much more a veterinary than a medical unit, and yet it possesses some interest, for one species at least is said to carry the virus of epidemic poliomyelitis.[1] I refer to *Stomoxys calcitrans*, the stable fly (Fig. 55). The Stomoxidæ are remarkably like smallish house flies, but each is a blood-sucker, being furnished with a stout piercing proboscis, swollen at the base and capable of drawing a scarlet head at every thrust. Look for these flies on the withers and fetlocks of horses and mules, though not infrequently they bite man, as I can testify.

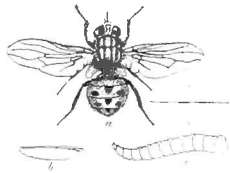


Fig. 55.—*Stomoxys calcitrans*

S. calcitrans has black spots on its abdomen which readily serve to distinguish it from *Musca domestica*. The species I have taken here—really a *Lyperosia* belonging to the same family as the *Stomoxidæ*—is much smaller and its abdomen is not spotted. The eggs, about 60 to the batch, are like those of the house fly, and the larvæ live on horse manure. The fly is not attracted by food, so that, as a rule, this insect is not a danger to man. Unhappily, the same cannot be said about the alert, grey-coloured flies of different sizes, and some quite large, which feed on decomposing matter and other filth, and bear the ominous name of the carcase flies. These are the Sarcophagidæ (Fig. 56), and I removed a small one from a marmalade pot on the *Braemar Castle* the day I arrived in Salonica. They are very common here, and you will often see them sunning themselves on patches of hot sand or earth. They have chequered abdomens of black and white and reddish heads, and either lay cigar-shaped eggs, like those of Lucilia and Calliphora, or extrude living larvæ. The latter are furnished with powerful claws and, as you know, have often been found in wounds during this war. They can tear and consume all animal tissues, including even soft bone, and have been known to burrow deeply and to cause death. Hence, carcase flies are to be dreaded both in the larval and the adult stage.

Fig. 56.—*Sarcophaga* sp.

Fig. 57.—*Hippobosca*

As we have considered a fly which gives birth to living larvæ, we may as well speak of another which does the same, though the larva turns so quickly into a pupa that the group to which the fly belongs—which includes the dreaded tsetse of Africa—is termed

[1] This has not yet (1919) been definitely proved.

the Pupipara. The representative of this family, which is common in the Salonica area, is a veterinary unit, a Hippobosca or tick fly, for it is much more like a tick than a fly (Fig. 57). You must have seen these insects—dark, flat, ugly, leathery, and yellow-marked—on the hides of horses and cattle and often clustering under the tails of these animals, whose blood they suck. One of the species in South Africa is the vector of *Trypanosoma theileri*. They rarely, if ever, bite man, but they have sharp claws and cling closely as a brother to your skin or clothing, giving rise to a sensation of loathing. Quite recently the view has been advanced that the Hippoboscidæ of the dog convey *Leishmania tropica*, thus causing Oriental sore. They can easily be caught by hand but are not easily killed. The best way to deal with them is to imitate the tactics of Cromwell in the case of Charles I. Tick fly

We will now pass from these larger diptera to more tiny but equally important flies, one family of which is said to have altered the history of Greece, to have accounted for the degeneration of the ancient Hellas. Needless to say, I refer to mosquitoes. Mosquitoes

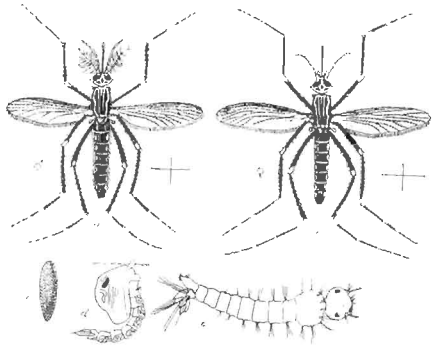


Fig. 58.—*Stegomyia fasciata* (*Aëdes calopus*)
The "Yellow-Fever Mosquito"

A great many people, including many medical men, seem to think there are only two kinds of mosquitoes—Anopheles and Culex. As a matter of fact, thousands of species are known, divided into all kinds of families and genera, most of which bear names which appear to have been chosen as brain exercises or to convert sane men into lunatics. Happily for our purposes we can limit ourselves to the section of the sub-family Culicinæ known as the Anophelinæ, and to the section called Culicales, which includes the Culex and Stegomyia groups. Indeed, as regards Stegomyia (Fig. 58), I doubt if it should be considered at all amongst the mosquitoes of Greece. I mention it only because it is an excellent traveller and may readily find its way to Salonica from Egypt and elsewhere

on board ships. I have not yet met with it here, but, during the summer, I should not think the night temperature falls below 20° C., which is that at which this mosquito loses activity and ceases to breed.[1] Hence, for all I know, it may be found occasionally in cisterns or barrels and other domestic water collections during the summer in Salonica. It is, of course, the yellow fever mosquito, and may be the carrier of the unknown organism of that obscure form of jaundice known as Mediterranean Yellow Fever which is endemic at Smyrna and elsewhere along the eastern Mediterranean littoral.[2]

Anopheline

However that may be, there is no doubt about the Anophelines, the three chief Grecian species of which are now breeding out. The adults are very easily distinguished. Two—*Anopheles maculipennis* (Fig. 59) and *A.* or *Pyretophorus superpictus*[3]—have spotted wings. The third—*Anopheles bifurcatus*—is clear-winged. The spotted-winged species are easily told the one from the other, for *A. maculipennis* has the spots, which

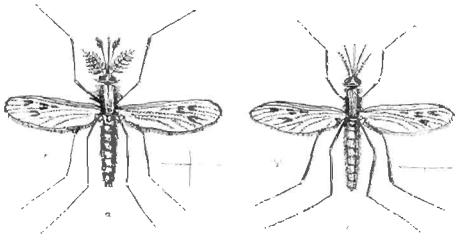


Fig. 59. *Anopheles maculipennis*

Wings of Anophelines

consist of clumps of scales, scattered about the wing membrane, while in *A. superpictus* they occur along the anterior margin of the wing or costa (Fig. 60). All three possess the other common Anopheline characteristics—standing on their heads (Fig. 61), not being hump-backed, and the palpi of the female being as long or longer than the proboscis—not short and clubbed, as in Culex.

All three species are known malarial carriers, albeit the proof has been better established in the case of *A. maculipennis* and *A. superpictus* than in that of *A. bifurcatus*.[4] The two former find a favourite breeding-ground in the swampy pools bordering the Monastir Road, while I have taken *A. maculipennis* and *A. bifurcatus* in dug-outs not far from Lake Langaza. I also secured a fine male *A. maculipennis* in my tent at the 4th Canadian General Hospital.

[1] Recent observations have shown that this is not the case. *S. fasciata* has actually been found breeding in England.

[2] This is probably a wrong hypothesis, but it is now known to convey the virus of dengue fever.

[3] Now known to be identical with *A. palæstinensis* (Theo.). *A. sinensis* was also found in Macedonia. *A. algeriensis* has also been discovered (Waterston).

[4] *A. bifurcatus* is now recognised as a definite carrier.

Remember that there exists here a genus of Culicales mosquitoes, which possesses spotted wings and hence is apt to be mistaken for Anopheles. This is Theobaldia, so called after Mr. THEOBALD, the well-known author of the great monograph on the Culicidæ

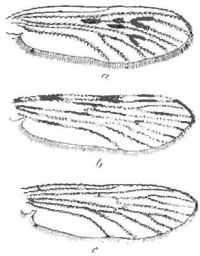


Fig. 60.—The wings of three important species of *Anopheles*

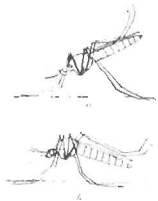


Fig. 61.—*Anopheles* (a) and *Culex* (b) in resting position. Note angles assumed by the bodies of the insects, relative to the surface on which they are resting

of the World, in—let it be spoken with bated breath—five fat volumes! In the case of all Culicidæ, the male can be distinguished at a glance from the female, the antennæ of the former being plumose or bushy, those of the latter pilose. Antennæ

Do not mistake harmless midges or Chironomidæ for mosquitoes. In the former the long narrow abdomen is nearly always turned up at the end (Fig. 62).

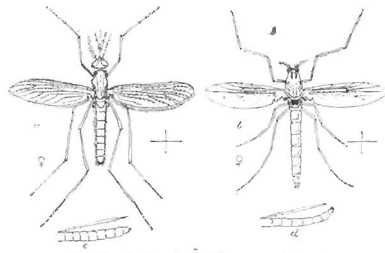


Fig. 62.—A *Mosquito* and *Chironomus* contrasted

I ask you to accompany me, in imagination, to the swamp area. It is a less expensive method, as regards boots and perspiration, than actually going there. *Life history*

Last week, before ever reaching the swamp, we would have found, on this side of the railway, pools contaminated by old horse manure in which countless Culex larvæ were wriggling joyously and Culex pupæ bobbing up and down. These have now vanished, partly owing to the filling-up operations and partly because Colonel ROBERTS applied cresol liberally. Once in the swamp, we will find pools along the side of the mill-lade and below its level. These pools, often surrounded by reeds and rushes, are full of several species of water weed. They are also full of frogs, snails, leeches and all kinds of aquatic life. Here a lucky dip will discover the large green larvæ or pupæ of *A. maculipennis*, or the small dark, fairly active, white-collared darters of *A. superpictus*. We may also light upon Culex larvæ of different species, but are not very likely to find eggs.

Water stages

The fusiform eggs of Culex are laid in little concave rafts, the winged eggs of Anopheles separately or in star-shaped clusters. A female Culex may lay as many as 400; a female Anopheles is doing her duty if she deposits 40 to 100. In two or three days larvæ hatch out from the eggs.

Eggs

Culicine larvæ are more active than Anophelines, and, owing to the presence of respiratory syphons or breathing tubes, hang head downwards when at the surface, save when swinging round their heavy jaws and heads to engulf some savoury, floating morsel. Anopheline larvæ lie parallel to the surface and look like little bits of floating sticks. They also possess a different shape, the thorax not being so square and marked off from the abdomen as in the case of Culex larvæ. The latter are typical wrigglers, the former tend to dart backwards along the surface of the water and jerk rather than wriggle when submerged (Figs. 63 and 64). In these swamps the larvæ of a species of Dixa are common, and at first sight suggest those of Anopheles, but they have a way of looping, not the loop, but their bodies, which is quite characteristic (Fig. 65). After several moults the mosquito larvæ become pupæ—in a week or ten days as a rule, but much depends upon temperature and food conditions. The pupæ, or nymphs, are interesting and beautiful objects, what with their bobbing movements, lashing paddles, respiratory trumpets and the eyes of the future gnat showing black through the chitin. After two or three days a split appears along the upper part of the pupal case and the curled-up mosquito uncurls itself, slowly emerges and, unless entangled at this wonderful and critical moment, stretches its wings and flies away. Think what its feelings must be when it finds itself in a bottle closed by a piece

Larvæ

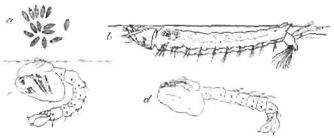


Fig. 63.—*Anopheles* [illegible] *parallel* [illegible]

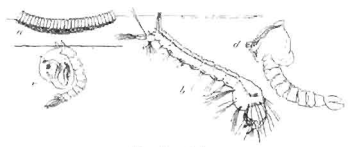


Fig. 64.—*Culex* [illegible]

Pupæ

of netting and without any opportunity for blood-sucking. I need hardly say that I refer to a female. I do so because only the female sucks blood. She is off on the blood quest at once, whether she be Culex or Anopheline. It is apparently an acquired habit, though she seems to require the blood-food for the proper development of her eggs. After fertilisation she proceeds to the nearest suitable water collection to lay her eggs. I have often noticed that a mosquito knows by instinct if a pool is suitable or not, *i.e.*, whether it will dry up or not before her brood hatch out. Now, as female mosquitoes from the marsh will visit hospitals and camps on the north side of Monastir Road for the purpose of imbibing blood, it seems to me that the establishment of trap pools on this side of the railway may be useful, for the egg-laden Anopheline will visit them on her return voyage, and, finding them most attractive, will lay her eggs in them, not knowing that inspectors are on the prowl. You will see that the mosquitoes have enemies. Foremost among these I will place Major JOHNSON, who has directed the drainage work of the fifteen hundred acres of swamp; Captain SHINGLETON, who has ably carried it out; and Captain LITT, who has lent his energetic assistance. Major BISSETT, an officer of that Service[1] which has always been in the forefront of tropical hygiene, has also now been drawn into the fray, so that the mosquitoes are likely to have a bad time of it. I may say I have not seen such extensive drainage operations since I witnessed the colossal work of the Americans in the Panama Canal Zone. The only other enemy I will mention is the Notonecta, or water-boatman, which swims on his back and looks rather like a submerged monoplane (Fig. 66). Several species abound here, and it is interesting that, where they occur in pools free from weed, mosquito larvæ do not seem to be present. It may be possible to utilise these carnivorous insects which grip larvæ as a terrier grips a rat and then engulf them slowly, tail first—a pleasant and a joyous sight! However, it must be remembered that they can wing their way out of the pools, and hence they might hie them home if the new quarters were not to their liking. We need not say much about the species of Culex found here. There is one, in all probability *Culex pipiens*, which is very near *Culex fatigans* (*see* Fig. 67, *page* 92), a possible vector of the unknown cause of dengue fever which is known to occur along the Grecian coast. I have not had time to work out those I have captured. Here we are just north of the 40th parallel of latitude, said to be the northerly limit of *C. fatigans*, but it is quite possible that it occurs in this locality. As regards the flight of mosquitoes, we knew little till an ingenious American at Panama invented an instrument for catching them when in flight. It consisted of plates of glass smeared with tanglefoot, which makes a transparent surface. He found that there is a return flight, that the insects fly much higher and swifter in the morning than they do at night, and that usually only adult females are in flight. As regards range, few Anophelines travel more than half-a-mile to a mile, but a favouring breeze may waft them considerable

Trap pools

Fig. 65. *Larva of Culex*

Notonecta

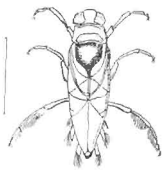


Fig. 66. *Notonecta*
The "Water-boatman"

Culex mosquitoes

[1] *The Indian Medical Service.*

distances, especially if there is shelter on the way. I may perhaps here recall the fact that the irritation following a mosquito bite is said to be due to the entrance into the little wound of a fungus derived from the œsophageal diverticula. It is not due to the secretion from the salivary glands which so often harbour the sporozoites of the malarial plasmodium.

One might speak all day about anophelines and malaria, but everyone here naturally knows all about micro- and macrogametocytes, zygotes, oökinets and sporocysts;

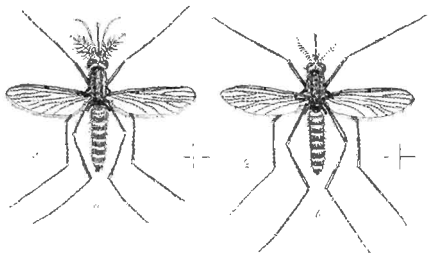


Fig. 67.—*Culex fatigans*.

Ceratopogons

so, after a word about the small and vicious flies known as the Ceratopogons, we must hasten on to the Phlebotomus fly which is likely to be of special interest to you, and to take a special interest in you during the Salonican summer. I mention the Ceratopogons because I found a lot of them caught in spiders' webs outside the boat-patrol dug-out at Aivasil. They are blood-sucking Chironomids, and, for their size, are amongst the most vicious insects alive. The so-called Culicoides are the worst, and they have blotchy wings devoid of scales (Fig. 68). They bite during the day and in the evening, but happily do not carry any disease. The same cannot be said of *Phlebotomus papatasii*, often, but erroneously, called a sand fly, one of the Psychodidæ, or owl-midges, a minute fly, hairy as Esau, and with prodigiously long legs which it will trail behind it as it struggles to get at you through the mesh of a mosquito net (Fig. 69). When I tell you that the body of a Phlebotomus, minus legs and wings, is only about a quarter the size of the head of an ordinary pin, you will realise that it is not easy to see and still less to catch. I once had a lady friend, so

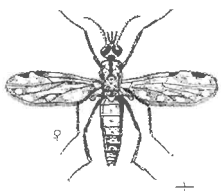


Fig. 68.—*Ceratopogon (Culicoides) kieffferi*.

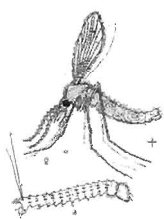


Fig. 69.—*Phlebotomus papatasii*: a, female; b, larva.

Sand flies

keenly interested in entomology, that she would sit in a suitable place of a late afternoon in hopes of securing phlebotomi for me when they settled on her neck. Unfortunately, such lady friends, Gentlemen, are rare! The fly breeds in damp places where there is rotting vegetation, such as dark cellars, caves, cracks and fissures in soil, under damp stone walls, in tunnels, the earthen parapets of trenches, etc. The tiny egg hatches into a minute caterpillar-like larva, with a spinous body and several long hairs at its posterior end. After pupation the imago emerges. In most species only the female sucks blood. Towards evening they sally forth and make their victims' lives a burden, attacking especially the wrists and ankles. During the day they frequent their breeding-places, the beds of streams, holes in trees, etc. It has recently been shown that they can easily be transported in timber and other cargo by sea-going vessels, a matter of some importance in these days of hospital huts, cooking sheds, etc. They are attracted by lamps and candles, but dislike the sunlight. A single fly is sufficient to infect a man with the unknown virus of sand fly fever, three-days' fever, or, as it used to be called, "dog disease," from the congested look of the conjunctivæ. It is beyond the scope of this paper to deal with phlebotomus fever and its treatment, but one may mention that for the attacks of Pappataci flies, as for those of mosquitoes, cassia oil is useful, or, if this cannot be got, a mixture of eucalyptus oil, oil of anise and oil of turpentine in lanoline.[1] A lump of camphor as a bedfellow also acts as a repellent. Another family of flies which requires mention are the Simuliidæ, or buffalo gnats, or true sand flies; small dark hump-backed flies, ranging in size from that of the head of a large pin to about one-eighth of an inch in length (Fig. 70). I have not yet found any here, but there can be little doubt they breed in some of the rocky mountain streams where the female lays her eggs in gelatinous masses on water weeds and stones. The larvæ are peculiar in that they have a sucker by which they fix themselves to stones and weeds. The pupæ live in a kind of cocoon. These sand flies are terrible biters. One of them was once described to me by an irate friend as being evidently the misbegotten progeny of a female Culex and a deformed house fly, but he had suffered very severely and doubtless saw the fly with distorted vision. When I tell you that one of the species is called *Simulium damnosum* you will admit that he had some justification for casting doubts on the fly's ancestry.

Sand fly fever

Simuliidæ

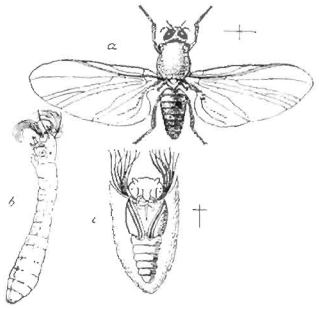


Fig. 70.—*Simulium*

As they are very rarely disease-carriers in man, I will make but brief mention of the large, stoutly-built Brachycera found in this part of the world, the Tabanids, the Hæmatopotas or Clegs, and the Chrysopidæ flies which plague the lives of horses and

Other flies

[1] Vermijelli is also good, the kind containing a little oil of citronella being preferable.

cattle, and not infrequently thrust their needle-like probosces through the human cutis (Fig. 71). They are very common on the Vardar, but are also found nearer home. You will see two species of Tabanids and a clouded-winged Hæmatopota (the latter given me by Mr. ANDERSON) in the small collection in the cigar box. I am also able to show you three fine specimens of Chrysops. Two species of this genus have been shown by Leiper to be the intermediate host of *Filaria loa* on the West Coast of Africa.[1] As I am dealing with them, I would direct your attention to the long, narrow and curious looking robber fly, one of the Asilids which prey upon the Brachycera and other insects. Very rarely an Asilid has been known to bite men. There are two specimens in the collection.

Robber flies

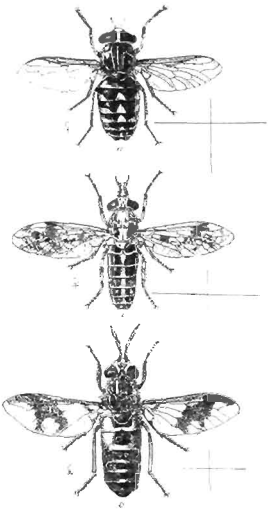


FIG. 71

WINGLESS PESTS

Turning now to the wingless pests, pride of place must be given to lice (Fig. 72). We need not trouble about the crab louse, which is comparatively rare, but the head and body louse, deserve close attention, for, as you know, they are the carriers of the spirochæte of relapsing fever, and act as vectors for the still doubtful virus of typhus. Moreover—but here, like Agag, I tread delicately—may they not have something to do with that most mysterious of maladies, "P.U.O.A."[2] *Pediculus vestimenti*[3] is the more important.[3] I think it would only weary you if I entered into a dissertation upon lice, but there are one or two points which merit attention, and which have only recently come to light. Thus it has been proved that lice eggs are very hygroscopic and that it does not require a very high temperature to kill them. BACOT has shown that lice, together with their eggs, can be destroyed in a moist temperature of 55° C. or 131° F. This is good hearing, for a recent work indicates that a female louse, during the six weeks of her eventful life, can actually produce 8000 young. Solomon advised the sluggard to consider the ant. Were he alive now, he might recommend the average British matron to study the female *P. vestimenti*.

Lice

Lice and typhus

I see that, following up the work of NICOLLE on typhus fever, Dr. JEANNERET-MINKINE has shown that the louse is only capable of transmitting the disease five days after it has

[1] FORBES has recently reported two cases of human infection with *Filaria conjunctivæ* (Addaris) in Macedonia, and has suggested that *Chrysops excutiens* may have been the transmitting agent.

[2] This turned out to be Trench Fever, the virus of which is conveyed by lice.

[3] Both the head and the body louse are now included under the name *P. humanus*.

fed from infected blood. It can then transmit infection for a period of two days.[1] The virus is exalted in virulence by its sojourn in the louse. According to NICOLLE, the fæces of lice are infective after nine or ten days, and he finds that the infection is possibly hereditary. If relapsing fever ever occurs here upon a large scale, and I am glad to think that this is very unlikely, there will be a fine field, for anyone who has time, to see if *Spirochæta recurrentis* behaves in the louse, like *S. berbera*, the spirochæte of North African relapsing fever. The disappearance of the spirochætes from the lice shortly after the latter

Lice and relapsing fever

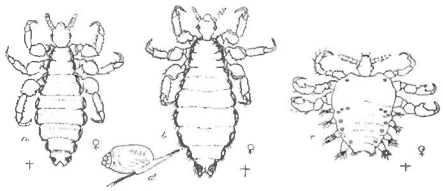


Fig. 72.—The three species of Human Lice

feed, and their reappearance on the sixth day, is a most interesting and suggestive phenomenon, but its consideration would take us too far afield. Dr. JEANNERET-MINKINE devotes 60 pages of his book to lice and their destruction, so I think I had better not embark on the question of preventive measures.

Gentlemen, the bed-bug is not absent from Salonica. The day I landed I called to pay my respects to the D.D.M.S. As I entered his office the thought flashed through my mind, as I encountered a peculiar odour, "either they are killing vermin here or my old friend, Colonel SUTTON, has a confirmed mastic drinker amongst his staff." I need hardly say that the former was the correct hypothesis. I do not know if anyone has studied the bed-bug here—probably the study has been the other way—but I expect both *Cimex rotundatus* and *C. lectularius*, the two main species, will be found to be present (Fig. 73). Wherever it can be used, the painter's lamp is the best thing for bed-bugs, provided always that fumigation with hydrocyanic acid gas is out of the question. They have never yet been absolutely definitely convicted of carrying any human disease, so we need scarcely spend more time upon them.

Bed-bugs

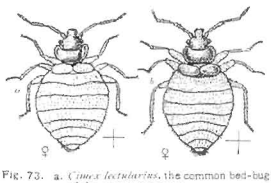


Fig. 73. a. *Cimex lectularius*, the common bed-bug of the temperate zone;
b. *Cimex rotundatus*, the bed-bug of the Tropics

I have not yet met the flea in Salonica, but I cannot believe that it does not occur. Remember the rôle of the rat flea in plague and the interesting performance that takes

Fleas

[1] Apparently it may be so from the fourth to the seventh day after the infective meal.

Fleas and plague

place in the flea's alimentary tract, for the proventriculus acts as a culture tube, and the plague bacilli multiply until a mass of them actually blocks the entrance to the stomach. The starved flea tries hard to get more blood and its œsophageal contents regurgitate, infecting, through the skin lesion, the healthy person on whom the flea is trying to feed (Fig. 74).

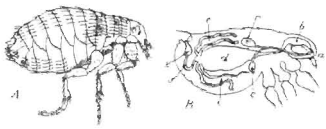


Fig. 74.—A. The Human Flea, *Pulex irritans*. B. Internal anatomy of same

Again, the flea in these parts very probably plays a rôle in what used to be called Ponos, the form of Leishmaniasis or Kala-azar found in Greece and its Archipelago. There is much that might be said about the flea, but all I can do is to imitate that lively insect and skip.

Ponos

We thus come to the ants, which, experimentally, have been shown to be capable of transmitting *B. typhosus* and *V. cholerae* to food. Consider, therefore, the ways of the diligent, but predaceous ant, and take steps to keep it away from all forms of human nutriment.

"Itch" insect

Our next insect may be introduced to you through the medium of a story which, while undoubtedly a gross libel on a most worthy body of men, has the merit of indicating how widely the ravages of *Sarcoptes scabiei* may be spread (Fig. 75).

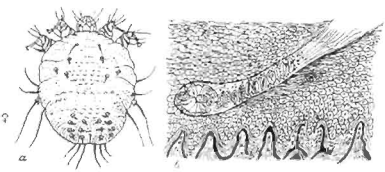


Fig. 75.—*Sarcoptes scabiei*. The "Itch" Mite

A visitor to the camp of a certain Highland regiment encountered the Sergeant-Major, and the following colloquy took place:—

Visitor: "Is there a Private Macpherson in this regiment?"
S.M.: "There are 217 Private Macphersons in this regiment."
Visitor: "Ay! but it's Private *John* Macpherson I am wanting."
S.M.: "There are 125 Private John Macphersons in this regiment, Sirr."
Visitor: "Ay! but ye will be knowing him because the Private John Macpherson I want has red hair."
S.M.: "There are 52 Private John Macphersons with red hair in this regiment."
Visitor: "Juist so, but ye canna miss him, for the man I want has got the itch."
S.M.: "A' the Macphersons hae the itch!"

Well, Gentlemen, all the Salonican field force are, happily, not suffering in like manner, but I understand there is a good deal of this troublesome skin infection. The cause is a mite, *S. scabiei*, and just as cheese mites tunnel into the best Stilton, so does the female Sarcoptes, which is oval and yellowish-white, burrow down into the skin till she reaches the succulent Malpighian layer, leaving a row of eggs behind her as she bores her way inwards. Her work completed, she yields up the ghost at the end of her tunnel. The male is by no means so inquisitive, and remains amongst the surface scales where, after mating, he also dies. The eggs vary from 22 to 50, and hatch after about seven days into hexapod larvæ. These moult twice on their passage to the surface, which they reach owing to the normal skin growth pushing them outwards. Pairing occurs while the female is still a nymph, and when the fertilised nymph has reached maturity she commences the burrowing business on her own account. The complete life-cycle lasts about 28 days. The infestation is more severe and wide-spread during hot weather. You are all familiar, indirectly I trust, with the symptoms of scabies, and you know that the itching is worst at night, because it is then that the young females are chiefly on the move.

Life history of Sarcoptes

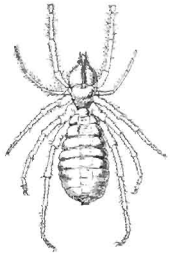


Fig. 76.—Solpugid
An ugly-looking, though harmless, creature belonging to the same family as the spiders

The free use of soap and warm water is indicated together with some parasiticide. For persons with delicate skins balsam of Peru is best, for the *οἱ πολλοὶ* sulphur ointment is the thing, or baths of potassa sulphurata (1 ounce to 4 gallons of water).[1] The patients' clothes should be stoved and a final bath taken to remove the parasiticide.

Here you will find a present from Mr. ANDERSON. It is a fine specimen of one of the Solpugidæ (Fig. 76), whose look is worse than its bite. It is allied to the spiders, and is commonly but erroneously termed a tarantula. It does not secrete any poison, but may inflict a rather painful wound. However, its shocking nakedness is its worst feature.

Solpugid

Gentlemen, you must think all insects are horrid, so I have kept to the end one that is far from being so, and that is the diligent, ingenious and useful scavenger or Scarab Beetle. You will see him any day, hard at work, cleaning up the roads, gathering manure from the veldt-like stretches—a laborious and successful worker (*see* Fig. 77, *page* 98).

A useful ally

In your fight against the insect pests of Salonica, which must of necessity be ceaseless, I would counsel you to take a lesson from the tireless Scarab. "Weary not in well doing" must be your motto, and, if this is the case, you will assuredly not lose your reward—the reward of seeing the troops under your care healthy and comfortable, free from vermin, and not scourged, as they have been, by dire diseases; the reward of seeing military operations proceeding unhampered by countless sick; the reward of having helped your country in her time of need.

[1] These remarks give but a faint indication of the full ritual required in treating scabies, and which must be fully and intelligently carried out if good results are to be obtained.

Acknowledgments

Gentlemen, I have only touched the fringe of a great subject, but I trust I have not wearied you. Still I cannot call a halt without expressing my obligations to Colonel ROBERTS, Colonel PRIMROSE, Captain MACKENZIE, Captain GRAHAM, Captain ARMOUR, Captain IMRIE and Mr. MCTAGGART of the 4th Canadian General Hospital, for much help and for the facilities they have afforded me; also to Mr. ANDERSON, already mentioned; to the officers who are carrying out the anti-malarial work here and elsewhere; and lastly to the O.C. of this Hospital for his kind hospitality. I feel sure that they, like myself, will feel more than repaid if this meeting has stimulated in those here present a real and abiding interest in the Medical Entomology of Salonica and in the preventive and remedial measures which form its natural corollary.

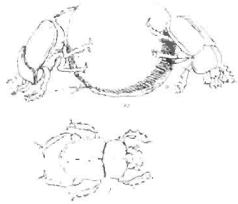


Fig. 77

SANITARY AND INSANITARY MAKESHIFTS IN THE EASTERN WAR AREAS

NECESSITY is the mother of invention, and war may well be termed the father of necessity, for certain it is that in war man is time and again in dire need. He has to make use of whatever material he can lay hands on. He has to set his wits to work to devise expedients. He has to invent and improvise on the spur of the moment to meet exceptional circumstances, and it must be admitted that his ingenuity is remarkable. If this is true of the combatant, as witness the tanks and hundreds of other marvellous devices, it is equally true, though on a more modest scale, of the Sanitarian. It has occurred to me that it may be of interest to the Society[1] to consider some of the makeshifts of the army hygienist in hot climates.

Necessity the mother of invention

I have been privileged to visit all the important tropical and sub-tropical theatres of war, sometimes I fear as a kind of stormy petrel, and, thanks to Mr. Wellcome—who placed the resources of his Bureau wholly at the disposal of the War Office—I have been able to secure a large number of instructive photographs, some of which I propose to show you, and which will serve as the text of a sanitary sermon. I may say that I was a member of the Medical Advisory Committee which visited Egypt, Mudros, Gallipoli, Salonica, Malta and Mesopotamia. I then accompanied Major-General PIKE,[2] C.M.G., D.S.O., A.M.S., to East and South Africa. Finally, at the invitation of General ALLENBY, I went to Palestine to see the anti-mosquito operations there.

Like a sermon, the address is divided into heads, for, contrary to the usual army view (I am not referring to the army *medical* view), sanitation is a very large subject, and I have no hesitation in saying it is, or should be, the most important branch of medical work in the field. The term "medical," as here used, does not include surgery. It is a trite saying that prevention is better than cure. Everybody knows it, everybody seems to agree with it, but only a minority practise it, and that is why hygiene is, as I have heard it called, the Cinderella of the Medical Services.

Cinderella of Medical Services

Now, in army parlance, sanitation is still, most unfortunately, almost a synonym for latrines. It looks as if it would take half a century yet to drive this idea out of the minds of a generation which, thanks to faulty initial education, scarcely yet know how they live, move and have their being. It is a sad business, for it spells human lives and untold misery and grief and wretchedness, little crosses in lonely places, wrecked homes and a vast burden of expense and inefficiency.

[1] Society of Tropical Medicine and Hygiene. [2] Now Major-General Sir W. W. PIKE, K.C.M.G.

Still there seems some prospect of better things, and one looks forward to the day when the sanitary flag will alter its hue and sport a mingled blue and white—the white of purity, the blue of hope.

Sewage Collection and Disposal

For once, however, I will be fashionable, and give pride of place to the subject of sewage collection and disposal, the great importance of which no one will deny, though I would again forcibly protest against the prevalent idea that these duties sum up what is meant by army sanitation.

Various methods

Different lands, different methods. What may do very well in Salonica is of no use in Mesopotamia; what answers admirably in Palestine is hopelessly out of place in East Africa. The latrine very often must be devised to suit the locality. The latrine is, of course, the place of collection, and it may be temporary, or as permanent as anything could be in the kaleidoscopic war which—so far as hostilities are concerned—has just ended in so glorious a fashion. It may or may not be also the place of disposal. When this is *not* the case, there must be some form of special receptacle for the collection of urine and of excrement. There is also, as a rule, for reasons of decency and shelter, a building, and, for reasons of comfort, a seat, but, believe me, neither of those is a *sine qua non* in war. Let us, however, look for a moment at buildings and seats. We need not worry much about material. Anything may have to serve, from sacking on poles to corrugated iron. In Egypt, matting, or boorsh, as it is called, stretched upon a wooden framework, answered well. In East Africa, grass or reeds served the purpose (*see* Fig. 78; *also* Fig. 80, *page* 103); in Mesopotamia, mud was ready for the moulding.

Latrine buildings

One of the chief points about a latrine is that, however makeshift it may be, it should be provided with head-cover. That is not to say it should be completely covered over, but sufficient roof should be provided not only to shield the user from sun and rain, where rain occurs, but to ensure that the receptacle shall be in the shade (Fig. 78). There used to be, there still is, a cheerful idea that the tropical sun has merely to glow upon fæces for a few minutes to sterilise them; that nothing evil can live beneath its rays; that, so to speak, sunned fæces are safe fæces. Nothing could be further from the truth. Quite apart from the fact that the sun cannot do these things (you will doubtless remember that in the Punjab it has been shown that typhoid bacilli can survive 23 hours of a sun drench), fæces with sun playing upon them are those upon which flies, and, at Basra, great brown and yellow hornets,[1] swarm and feed. In East Africa especially, I was struck with the contrast, though it is visible everywhere—the shaded latrine had few flies, and they were scattered more or less; the sunny latrine swarmed with them, and they were concentrated on the *pan contents*. *All latrines, therefore, should be covered. Where it can be managed* the walls should not come right down to the ground. It is in latrine angles that dirt collects, and the angle with the ground is one which can often be avoided (Fig. 79). Ventilation is easily secured by leaving a space between the roof and the walls. As a matter of fact, most makeshift latrines are only too well ventilated. I have known some which resembled caves of the winds.

[1] These have been identified as *Vespa orientalis*, F.

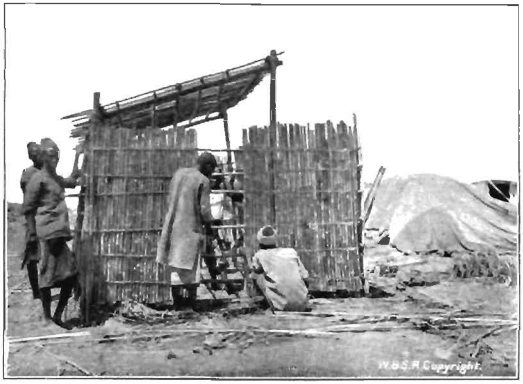


FIG. 78.—LATRINE FOR DYSENTERY CASES, IN PROCESS OF CONSTRUCTION PORT AMELIA

FIG. 79.—GOOD TYPE OF FLY-PROOF LATRINE BUCKET, AUSTRALIAN CAMP TEL-EL-KEBIR

Separate fly-proof seat with falling lid on each pail. Note litter at the angle formed by the ground and the wall of the latrine; also absence of head cover

Seats

And now as to seats. It may be said at once that the less seat the better, for then there is the less to foul. The Indian, the Egyptian and the African native, thanks to their physiologically-sound squatting habits, do not require seats at all—a very fortunate provision. The perverse European is fond, however, of providing them with seats. What is the result? I recall the story of an ingenious person who made quite a mint of money in the old town of Edinburgh by attracting crowds into a modest building with the following outcry:—

"A penny, a penny, a penny to see
A horse with its head where its tail ought to be."

The expectant citizens found only a horse standing with its tail to the manger. Now this was unlikely to lead to anything very unsanitary, but it is quite a different matter when one of the Egyptian Labour Corps carefully supports a falling latrine lid with his forehead, and deliberately ruins the aim and object of a portable fly-proof latrine, admirably designed from a sanitary standpoint.

I hope to show you various types of seats, and will then descant briefly on their faults and virtues. Of special interest is that constructed by the Germans for safari in East Africa (Fig. 81). It is in the form of a camp stool with two seats, the upper of a normal type, the lower fashioned as a latrine seat, and therefore possessing a suitable aperture with leather-bound edges. I fear it must be classed under the insanitary makeshifts, though it is ingenious and must add to the traveller's comfort.

Recep tacles

We turn now to the receptacle. Rarely, very rarely, has the sanitary bucket been visible in large numbers (*see* Fig. 79, *page* 101). There is really no need for it, thanks to the petrol tin and the petrol drum. Where we should have been without these aids to hygiene I cannot say. They have played almost as important a part in the war as the tanks.

The Macpherson system, with which you are doubtless all familiar, was much in evidence in Macedonia, and I have also seen it and, I grieve to say, smelt it in France. Theoretically, it is an excellent system. Under rigid supervision it may be a success. Practically it is a failure, human nature being what it is.

Of all devices the sliding or "drawer" petrol can is probably the neatest and best. I show you a picture of it (*see* Fig. 85, *page* 106), and you will see that it has several advantages. It fits close under the seat and cannot get out of place; it hangs suspended, and so the bottom of the tin does not get worn away; and there are handles which keep the sweeper from fouling his hands.

To some extent the receptacle must vary with the method of disposal. The pail system can be used either when trenching or incineration is employed; the half petrol can and other small collecting reservoirs are an integral part of the incinerating process.

Incinera tion

In temperate climates, when incineration is employed, the urine, passed when at stool, is a source of trouble, and must be separated from the solids. This is done sometimes in the tropical war areas, but is rarely necessary. The quantity is much less, and, with a good incinerator, everything goes, as the sanitary corporal aptly puts it, to blazes! Still, at Aboukir, in Egypt, I saw a pail constructed on the principle of a colander, a double pail with the bottom of the inner bucket perforated to allow the liquid to drain away. Its solid contents then went to the fire.

FIG. 80. - NATIVE LATRINE (UNCOVERED). K.A.R. LINES, TABORA

FIG. 81. - ADAPTATION BY THE GERMANS OF CAMP-STOOL FOR USE AS LATRINE SEAT

Another useful type is the Mackenzie pattern, where one petrol drum is slung inside another.

One of the best and most ingenious methods I have witnessed was in use at a carrier hospital at Dodoma in East Africa (Fig. 82). Here the metal vessels in which engineers carry earth formed the receptacles, and, when full, these latter were picked up by tongs and bodily thrust into the flames. In this way the contents were got rid of, and the receptacles sterilised at one and the same time.

Incinerators

Of the making of incinerators there is no end. Nearly every sanitarian invents an incinerator, and the remarkable thing is that most of them can be made to work. I said "made to work" advisedly, for much more depends on the stoker than on the stokehold.

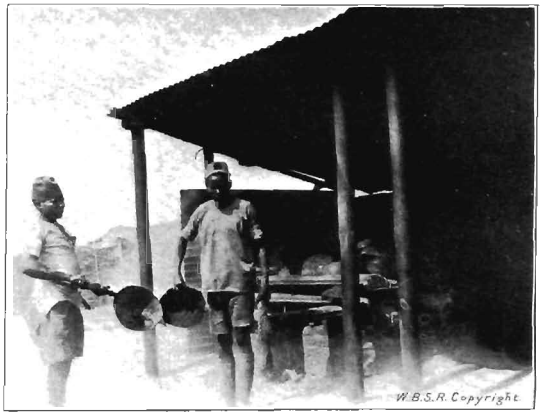


FIG. 82.—METHOD OF INCINERATION PRACTISED AT CARRIER HOSPITAL, DODOMA
The fæcal receptacles, held by tongs, are plunged bodily into the fire. These metal receptacles are those used by engineers for carrying earth.

The sweeper

The running of an incinerator is an art, and a good incinerator man should always receive extra pay. Another important point is that, whether he is good or bad, he should live close to the altar which he serves. How many times has one found a latrine neglected because a sweeper was away at lunch! Somehow one forgets that sweepers appreciate lunch like anyone else. Considering their work it seems a little hard to credit, but it is none the less true. To meet occasions of this kind, and also those where a deficiency in sweeper personnel prevents prompt clearance of the tins, an assistant-surgeon of the Indian Medical Service in Mesopotamia devised an ingenious and yet

FIG. 83.—METHOD OF PROTECTING PAN CONTENTS IN INDIAN LATRINE FROM FLIES, AS SHOWN AT SANITARY DEMONSTRATION CENTRE DAR-ES-SALAAM

FIG. 84.—BATTERY OF SUGAR-LOAF INCINERATORS, AMARA
Note proximity to Latrine

simple method of covering the pans and their contents. Not only does it do so efficiently, but it overcomes the difficulty caused by the racial and religious prejudice of many Indian soldiers against touching anything unclean. Two metal hoops, like croquet hoops, are placed one behind and one in front of the double tins (for urine and faeces) supplied to Indian units. A long piece of sacking, which may be soaked in creosol or arsenite of soda, is attached by one end to the posterior hoop: the other, or free end, in which a piece of wire serves as a handle, being hooked up to the latrine wall. The user, after easing himself, detaches the sacking from the wall and lets it fall over the tins, which it shrouds like a curtain, but, being supported by the hoops, does not touch (*see* Fig. 83, *page* 105). I saw this system being used successfully not far from Kut, but it is well to remember that "out of sight" is apt to be "out of mind," hence this scheme should only be employed to meet a special difficulty.[1]

Fly-proofing for Indian latrines

FIG. 85. SANITARY DEMONSTRATION CENTRE, BASRA

Showing in foreground types of fly-proof latrines with petrol tins suspended from sliding runners. The seat-cover on the right is badly arranged. It falls back too far to be self-closing.

A great deal is said about the necessity of incinerators being provided with baffle-plates and combustion chambers. Where very large numbers of men have to be catered for, and where the vicinity is populous, this is, no doubt, necessary and desirable, but hundreds of incinerators which never possessed baffle-plates are doing good work to-day. I cannot describe them all at length, but I exhibit photographs of different types (*see* Fig. 84, *page* 105; *and* Fig. 88, *page* 108), and direct attention to ingenious makeshifts, specially the tin and mud open "cone" incinerator for horse manure, as used in Mesopotamia, where, remember, there is practically no stone and plenty of scope for the inventor (Figs. 86 and 87).

Fly-breeding under incinerator

One thing I would like to say: If at all possible, place your ordinary incinerator on a cement foundation (*see* Fig. 88, *page* 108). Otherwise the ashpit is very apt to become

[1] A new, permanent type of fly-proof latrine, for the use of natives in India, is described by Major W. R. J. SCROGGIE, C.I.E., I.M.S., in the *Indian Medical Gazette* for October, 1919.

Fig. 86.—Open Cone Incinerator for Horse Manure, Constructed of Petrol Cans, Small Tins, Wire and Mud

Fig. 87.—Open Cone Incinerator being used for the Burning of Manure

Photographs 86 and 87 by Captain P. F. Gow, D.S.O., I.M.S.

a fly nursery. In Mesopotamia the number of fly maggots found living cosy if precarious lives under incinerators was amazing.

The motto of all who incinerate must ever be "from the pan direct to the fire," otherwise incineration may become a very dangerous method of disposal. The sweeper who mixes bhusa and fæces on the ground, and leaves the mass to the flies until he feels inclined to shovel it piecemeal into the fire, is only too common, and is a danger to the Forces (Fig. 89).

Wet privy

In Mudros I got one of Lumsden's home septic-tanks—with which you are doubtless familiar—erected, and it worked quite well. I did not see another till I was at Potchefstroom, and there, at a demonstration centre, I obtained the photograph which I exhibit (*see* Fig. 91, *page* 110). This is a cleanly method, and I understand that farmers in the Transvaal are now adopting it. As you know, it was originally introduced for the hookworm campaign in the Southern States of America.

FIG. 88.—INCINERATOR PLACED ON CEMENT BASE TO PREVENT FLY-BREEDING.
3RD S.A. FIELD AMBULANCE. SUMMIT, EAST AFRICA

And now a word as to latrines without receptacles.

Latrines without receptacles

The most familiar is, of course, the box-seat type with falling lids, placed over a deep trench. It has been in use on all the Fronts I have visited, and one may say of it that when it is good it is very, very good, and when it is not it is horrid. In other words, when properly constructed, properly looked after and properly used it is an excellent sanitary contrivance. Too often, however, one or other of these desiderata is lacking, and then the trench below it becomes one vast breeding-ground for flies. This is what happened in the Sinai Peninsula. The box-seats cracked and warped with the sun; they were not repaired, and flies soon found their way through cracks and holes and broken lids, attracted by the irresistible odour of the trench contents. To some extent this difficulty can be got over by constructing the box partly corrugated iron, as was done in Macedonia (Fig 90), but I fear the box latrine has not fulfilled the hopes of its admirers. There is, however, a modification of the system which

FIG. 89.—MUD-BRICK INCINERATOR, RIVER POST NEAR AMARA

The sweeper is shown mixing bhusa and human excreta. The mass is often left for a considerable time before being fed to the incinerator, and in this way flies gain access to it.

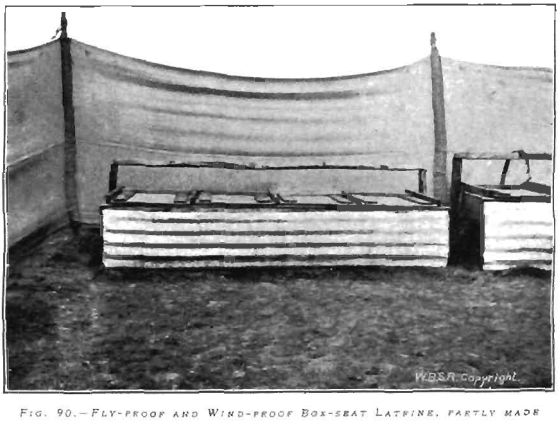


FIG. 90.—FLY-PROOF AND WIND-PROOF BOX-SEAT LATRINE, PARTLY MADE OF CORRUGATED IRON

has much to commend it. At intervals over a long deep trench, supported on iron rails, and provided with rims and covers or little box-seats with falling lids, is set a number of petrol drums, which serve as pedestal shafts to the trench (Fig. 92). The latter is roofed in elsewhere and covered by beaten-down earth. Such a system certainly lessens the risk of fly infection, but, to make assurance doubly sure, a certain German doctor[1] long ago invented the smoke method, and in many parts of East Africa one encountered the smoke latrine. The principle is simple, and is shown in the photo (*see* Fig. 90, *page* 115). Here again, however, care and supervision are necessary. I remember a certain officer commanding a hospital, who led me with pride to see his smoke latrine. The lid was removed, the smouldering mass of leaves and wood, evolving pungent fumes, was lowered in the brazier, and immediately with a loud and angry buzz, there emerged green Lucilia, grey Sarcophagidæ, blue Calliphora, swarms of small Muscidæ, and all the flies which should not have been there, but which, owing to neglect, had got a chance of gathering to the feast.

Smoke latrine

FIG. 91.—IMPROVISED LUMSDEN WET PRIVY OR HOME SEPTIC-TANK METHOD FOR DEALING WITH EXCRETA

Note fly-proof seat, closet barrel and effluent barrel. There is an anti-splash arrangement inside the closet barrel. Sanitary Demonstration Centre, Potchefstroom. Urine funnels seen in background.

The river Euphrates and its fish played the part of receptacles at Chabaish in Mesopotamia (Fig. 93).

Units on the march have no time for elaborate latrines. They have to employ comparatively shallow trenches. Now, if these are not protected at the time of use, and not properly filled up and treated after use, other units following after will be plagued with flies and possibly with dysentery. Hence the value of what may be called the portable-plank method. Each unit should carry these creosoted or cresoled planks, and use them as temporary trench-covers, alternate planks being removed, and the men straddling across the gaps and replacing the planks (*see* Fig. 95, *page* 113). A guard must be

Portable-plank method

[1] Dr. PETER of the Cameroons.

FIG. 92.—BAD TYPE OF TRENCH LATRINE, DODOMA
The seat is uncomfortable and too high, there is no roof, and the covers of the cylinders leading to the pit are defective.

FIG. 93.—LATRINES FOR BRITISH UNITS, BUILT OUT OVER A CREEK, CHABAISH, EUPHRATES

posted to see the operation is properly conducted. Full details, including the dimensions, are given in the "Memoranda on War Diseases" issued by the War Office.

Transport latrine

Lastly, I show you a naval improvisation, the type of latrine for native troops, adopted, after much tribulation, on the Victoria Nyanza steamers. It is merely a *framework, covered with cloth or tarpaulin, projecting from a port (Fig. 96).* It effectually prevents fouling of the vessel's sides.

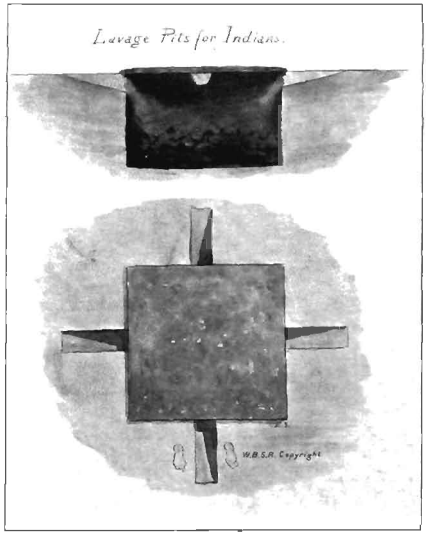


FIG. 94.—GOOD TYPE OF COVERED LAVAGE PIT FOR USE OF INDIANS.
Note channels which are lined with tin

Indian lavage

A few other points and we turn to a more savoury subject. As you know, the Indian practises "abdust" or lavage, and it is very important that he should do so under sanitary conditions. Here is the best scheme of many that I have seen (Fig. 94). A square pit is dug and filled nearly to the surface with tins or rubble. It is then covered over, but a hole is left on each of its four sides. Sloping channels, lined

FIG. 95.—TEMPORARY LATRINE COVERED BY OILED BOARDS SET SIDE BY SIDE AT KANTARA, CANAL AREA

This form was employed owing to proximity of strongly brackish subsoil water to ground level

FIG. 96. THE S.S. "USOGA" ON VICTORIA NYANZA, SHOWING LATRINE ARRANGEMENT FOR NATIVE TROOPS

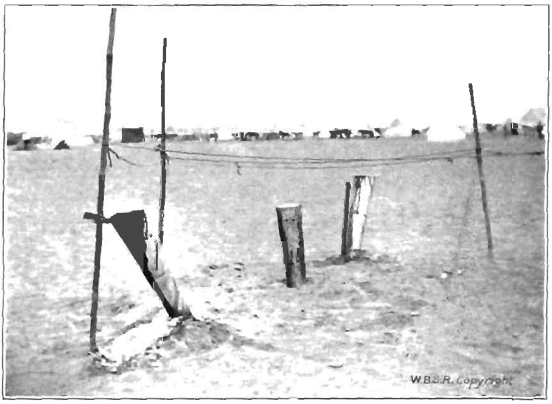


FIG. 97. URINALS COMMUNICATING WITH SOAK-PIT. ONE SHOWS FLAP TO PREVENT DRIPPING ON GROUND

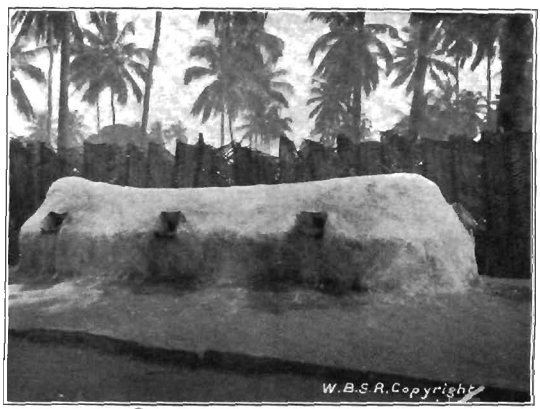


FIG. 98.—LARGE ANT-HILL USED AS URINAL. DÀR-ES-SALAAM

with tin, lead to each of these holes, and the Indian, straddling across the channel performs his ritual *sans peur et sans reproche*.

The question of field urinals need not detain us. They vary from the ubiquitous funnel—at first mistaken for a listening-post (Fig. 97)—to the East African ant-hill, which has most marvellous absorptive powers (Fig. 98). A smoke urinal has also been employed—rather an unnecessary complication (Fig. 99). Urinals

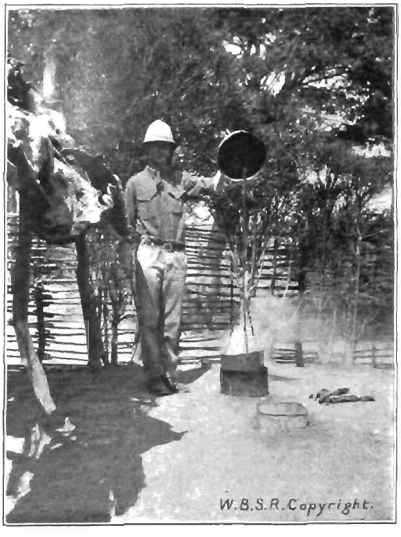


FIG. 99.—SMOKE URINAL, NO. 1 CARRIER HOSPITAL, IRINGA
SHOWING METHOD OF LOWERING BRAZIER

Food and Cooking

Food

I suppose it seems heresy to say so, but I am convinced that the excellent health of the troops on the Western Front is due quite as much to the indefatigable efforts of the Royal Army Service Corps as to those of the Royal Army Medical Corps, speaking for the moment merely as regards the question of transport and distribution of food. I am sure that many officers of the Medical Corps will agree with me. It stands to reason. Feed a man well—that is, give him plenty of good food in sufficient variety, adapted to his racial peculiarities, to the climatic conditions under which he is serving, and well cooked—and

Fig. 100.—Fenestrated Mud-brick Cook-house of No. 130 Combined Field Ambulance, on the road north of Jaffa
(Designed by Lieut.-Colonel Otway, R.A.M.C.)

in the great majority of cases he will defy not only the enemy but the bacillus. I am certain also that, anti-mosquito precautions and preventive inoculation excepted, good food and proper cooking are more important sanitary measures than any others in the field. Where were they not forthcoming? In Gallipoli, Mesopotamia and East Africa. What war areas have had the greatest disease incidence, the highest mortality? Gallipoli, East Africa and Mesopotamia. To this day it is not fully realised that questions of food and cooking are scientific questions—that the advice of dietetic experts should invariably be sought and followed. If this were done, one would not see ration scales for

Cooking

native African troops devoid of substances essential to life and health—one dietary without sugar, another minus vegetables. It seems scarcely credible, but it is true. Now cook-houses are important places. In the earlier stages of the war everyone tried to make cook-houses fly-proof, with the result that they were converted into fly-traps. Anyone who was at Mudros will confirm this statement. It is no use employing wire netting in a cook-house unless you have double doors, can execute instant repairs, and can post a sentry to shoot those who put stones under the doors to keep them open. No, Faulty kitchens

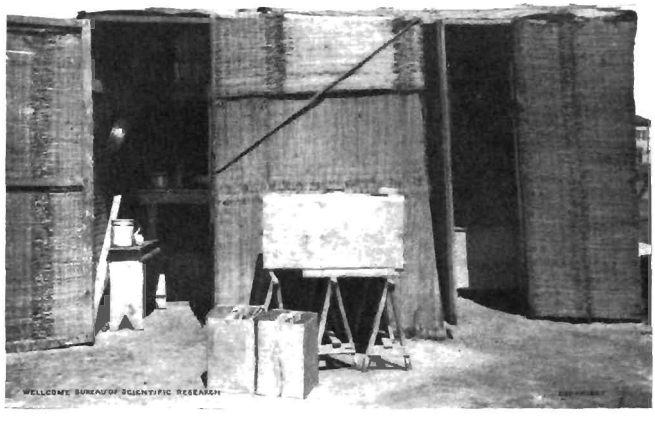


FIG. 101.—COOK-HOUSE AND LATRINE SIDE BY SIDE

a cook-house must be well ventilated, as dark as possible, and its door should face north in the Northern Hemisphere and south if it is on the other side of the Equator. All this sounds trivial, but at Lindi, in East Africa, I saw a cook-house on which many pounds had been spent, and it was worse than useless. On the other hand, I show you a fenestrated mud-brick cook-house, of most excellent design, which I saw near Jaffa (Fig. 100). It is a new and original pattern, well worthy of adoption, designed by Lieut.-Colonel Otway, R.A.M.C. Fenestrated type

Cook-houses and latrines should be placed as far apart as possible. Fig. 101 certainly does not suggest that this principle is always carried into effect.

The photographs show you all kinds of open-air kitchens and field ovens. Much ingenuity is often displayed in their construction. The same is true of field-bakeries—most important institutions in which very often wonderfully good bread is baked. Believe me, good bread often means good health, for, as you know, bread is the "staff of life."

Bakeries

I direct your attention to the plan of an underground larder used by a crack cavalry regiment in Mesopotamia (Fig. 103). While their comrades spoiled their teeth and their tempers on tough meat, this unit enjoyed tender roasts and stews throughout the fiery heat of a Mesopotamian summer—a fitting reward of enterprise.

Larders

Professor SIMPSON, at the last meeting of the Society,[1] paid a tribute to our gallant allies, the Serbians. I saw a good deal of these fine peasant soldiers just after they reached Salonica from Corfu. We had a great deal to learn from such veteran campaigners. While our men too often "pigged it" in their tents—many units at that time having no mess marquees or huts—the Serbians dined in comfort at stone tables under an awning of tree branches, which they collected from a place eight miles away. You will see their stone serving-tables (Fig. 104), their kitchens, and the officers' dining-table and seats of wicker or basket-work (Fig. 102), both comfortable and picturesque.

Serbian methods

FIG. 102.—IMPROVISED DINING-TABLE AND SEATS FOR OFFICERS OF SERBIAN ARMY. MADE OF WICKER-WORK

[1] Society of Tropical Medicine and Hygiene.

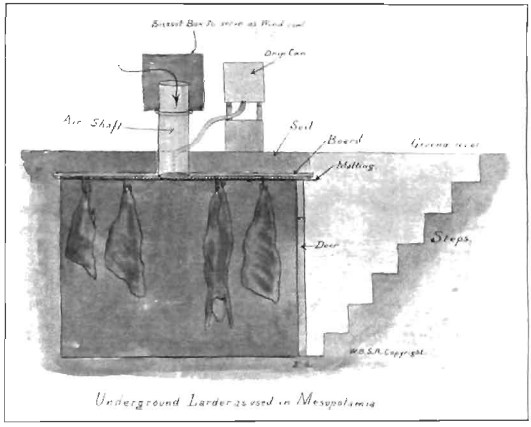


FIG. 103.—METHOD OF KEEPING MEAT, AND ENSUEING THAT IT WAS TENDER EMPLOYED BY A CAVALRY REGIMENT IN MESOPOTAMIA

FIG. 104. IMPROVISED MESSING AREA. DINING-TABLES AND SERVING-TABLES MADE OF STONE. ROOFED WITH LEAF SHELTER. SERBIAN ARMY

Water Supplies and Water Purification

Lack of space prevents any reference to the hundred and one contrivances for dealing with sullage water in hot countries, but the photographs shown speak for themselves. Of more importance is the question of water supplies and of water purification. The sources of supply varied greatly on various fronts. Egyptian filtered water, brought by tank steamers, was the chief supply in Gallipoli; in Salonica, mountain streams were often a source; in Palestine, the sources varied from the beautiful "Springs of the Sultan," near Jericho, to the clear waters of the rapid Auja River, which flows into the sea near Jaffa, and included the new reservoir supply for Jerusalem gathered from the hills about Bethlehem. In Egypt, the Nile and its canals furnished the supply, and brought risks of bilharzia; in Mesopotamia, a dry and thirsty land, the Shatt-el-Arab, the Tigris, the Euphrates, the Karun, and surface wells yielded their waters, sometimes with the cholera vibrio in them; in East Africa, men drank from rivers and from water-holes, from mountain streams and from wells, and ran many risks in consequence, for the makeshifts devised for protection were too often well worthy of the name. Let us look at some of them and at methods of collecting, transporting, storing and purifying water on various fronts. Putting a strand or two of barbed wire round a water-hole, and placing a native sentry on guard over it, are measures of slight futility, though better than nothing. Where possible, a high fence with a hole in it through which the collecting hose passes, should surround the spring or pool. This was done at Summit, on the Mikese-Rufiji road, in East Africa, and answered excellently (Fig. 106). At Amara,

Sources of water.

Protection of source

Fig. 105.—Water Transport in Petrol Tins. Note small Turkish Well. Clark's Gully, Anzac
The trenches are on the top of the hills seen in the background

FIG. 106.—WELL-PROTECTED "SPRING" WATER SUPPLY AT SUMMIT, EAST AFRICA, SHOWING HOSE LEADING TO WATER-TANK

FIG. 107.—RUBBER CANVAS FOR HOLDING DRINKING-WATER. THESE CANVAS TANKS HOLD 2300 GALLONS

in Mesopotamia, the admirably protected well areas with covered wells were one of the sanitary features of the place, and a tribute to the Royal Engineers.

The only special device for collection which I will mention is the use of the huge fruits of the baobab tree as pitchers when drawing water from wells.

Storage

Storage is often a troublesome business, especially in a country like Mesopotamia, where for a long time transport was a great difficulty. That is one reason why

FIG. 108.—UNGUARDED WATER SUPPLY, RIVER MBEMBURU, NAHUNGU, SHOWING COLLECTION IN PETROL TINS IN WHICH WATER IS BOILED ON THE SPOT.

large rubber canvas troughs, each holding 2300 gallons, came into use (*see* Fig. 107, *page* 121). Their only drawback was that they were not covered. Tanks hollowed out in the soil, lined by tarpaulin and covered with canvas, were common in the Advanced Corps Area, in 1916.

Faulty methods

I have seen drinking-water stored in a German shell-case, which makes an excellent receptacle. Unfortunately, someone had placed the long metal cylinder in the blazing sun and the water was scarcely refreshing. Even makeshifts must be properly used. A very bad type of water-trough was the canvas diggie made in Basra—a clumsy, heavy, leaking arrangement.

FIG. 109.—WATER-BOILING APPARATUS, INDIAN CLEARING HOSPITAL NAHUNGU

FIG. 110.—OLD METHOD OF PREPARING CHLORINATED LIME SOLUTION FOR WATER STERILISATION.
INDIAN ORDERLIES SHAKING BOTTLES, BASRA

Distribution

Water was transported in many ways: by carts, in pakhal and fantass, on mules and camels, in bags, in petrol tins as at Anzac (*see* Fig. 105, *page* 120)—a weary business; but I do not recall any very novel devices, save the use of iron telegraph poles as pipes at Sheikh Saad in Mesopotamia, and of split date-palm trunks as water-gutters.

Purification

As regards purification. In some places I have seen river-water boiled in petrol tins on the bank, and all the good of the boiling vitiated by the transport people plugging the openings in the tins with bunches of grass or reeds—a very insanitary makeshift (*see* Fig. 108, *page* 122). On the other hand, an Indian hospital had an admirable arrangement whereby water was sterilised in special boilers and gravitated by tin channels to metal receptacles (*see* Fig. 109, *page* 123). At Port Amelia, in Portuguese territory, a British hospital adopted the principle, but placed the receptacles up-hill from the boilers, and so the boiled water had to be carried up to them by hand, an element of risk being thereby introduced. As has been truly said, common sense is rare sense.

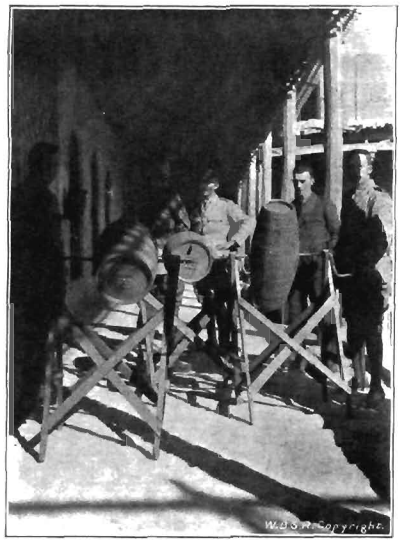


FIG. 111.—NEW METHOD OF PREPARING CHLORINATED LIME SOLUTION FOR WATER STERILISATION BY USE OF CHURN

Two makeshifts for preparing good emulsions of chlorinated lime are worth noting—both employed in Basra. The earlier one consisted in Indians violently shaking Winchester quarts filled with the solution (*see* Fig. 110, *page* 123); the latter was represented by ingenious hand-churns, and worked very well (Fig. 111).

Water cooling

Elaborate improvised labyrinths were at one time in vogue in the Suez Canal zone to ensure a thorough mixing of water with alum, and thereby a satisfactory precipitation prior to filtration. The design reminded one of the maze at Hampton Court. A sergeant-major at Amara effectually prevented thirsty souls from drinking out of a tin dipper, and thereby possibly contaminating a water supply, by serrating the edge of the tin (Fig. 112); while a good method of cooling water employed in Macedonia was to surround a water-tank with sandbags, which were kept wet, an air space being left between the bags and the tank.

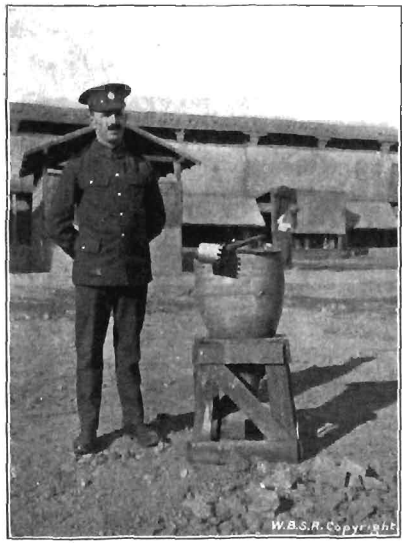


FIG. 112.—PERSIAN HUB AND DIFFER, SHOWING METHOD OF SERRATING THE EDGE OF THE LATTER TO PREVENT MEN USING IT AS A DRINKING-VESSEL.
No. 23 BRITISH STATIONARY HOSPITAL, AMARA.

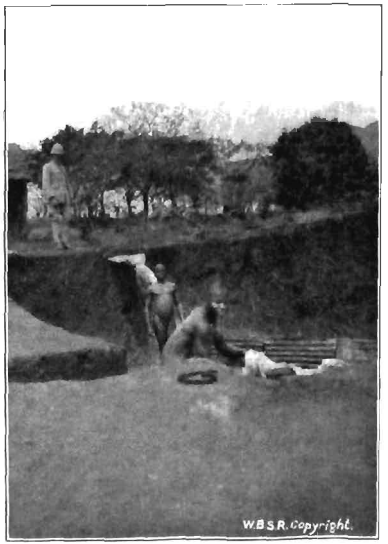


FIG. 113. IMPROVISED ARRANGEMENT FOR NATIVE ABLUTION.
No. 15 STATIONARY HOSPITAL, MOHOGRO.

Bathing and Washing

Ablution

Great ingenuity was often displayed in the construction of shower-baths, but nowhere more so than in the Corps Area in Mesopotamia, where the absence of wood and stone resulted in the remarkable tin structures, a picture of which I show you (Fig. 115). The simplest makeshift, however, was at Morogoro, in East Africa, where, by hollowing out the ground, a stream was made to cascade and thereby supply a splendid douche (*see* Fig. 113, *page* 125). The damming up of natural water-courses often resulted in the provision

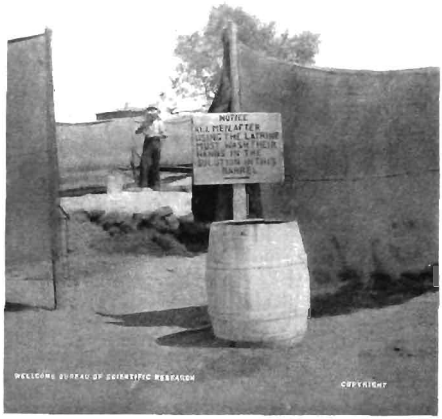


Fig. 114.—Barrel of Disinfectant Solution outside a Latrine

of excellent baths (Fig. 116), and a fine swimming-pool was created by the use of a huge metal tank employed in the soda works at Wady Natrun in the western Egyptian desert.

Ablution bench

The ordinary ablution bench was very unsatisfactory until one genius thought of adding a rail, on which coats and shirts could be hung (*see* Fig. 118, *page* 129). Previously these garments, like "Uncle Pete's hat," had been hung on the ground, and were very apt to get dirty and wet. Talking of cleaning: the plan of scrubbing steamers' decks on the Victoria Nyanza with half coco-nut shells came as a revelation to me, and is probably new to most of you.

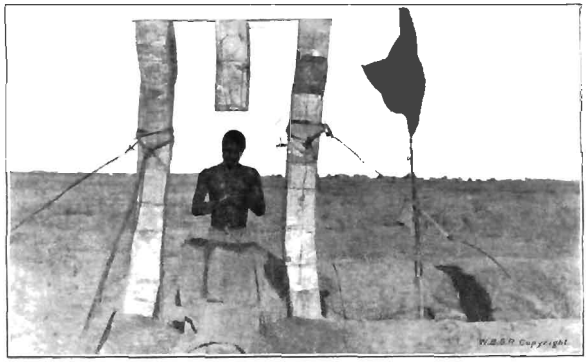


Fig. 115.—An improvised Shower-bath made from Petrol Cans and Wire. Highland Nullah, Tigris Front.

Fig. 116.—Improvised Bathing-place, Macedonia, formed by damming up the course of a Mountain Stream.

Disinfection

Disinfection is closely allied to bathing and includes the destruction of vermin. The simplest makeshift for dealing with clothes lice is probably the oldest—the picking method—carried out either by the sufferer or a friend. I show photographs illustrating both operations, the first taken in the front line trench at Anzac, where the picker was much more interested in his prey than in bullets flying overhead (Fig. 116); the second *secured in Amara, and rather reminiscent of monkeys at the Zoo* (*see Fig. 123, page 133*).

FIG. 117.—RAILWAY VAN DISINFECTOR

Serbian barrel

But we can do better than this in the army, and you will find illustrations varying from the Serbian barrel to the most useful railway van disinfector (Fig. 117), which of all methods I have seen accomplishes most in the shortest time, as you will find if you peruse Col. Wm. HUNTER'S articles in the *Lancet* for Sept. 14 and 21, 1918. Both these useful methods owe their introduction to Lieut.-Colonel STAMMERS, R.A.M.C. Now the Serbian barrel is often wrongly used. What is the use of placing it on a billock and having to

FIG. 118. ABLUTION BENCH FURNISHED WITH RAIL FOR HANGING CLOTHES

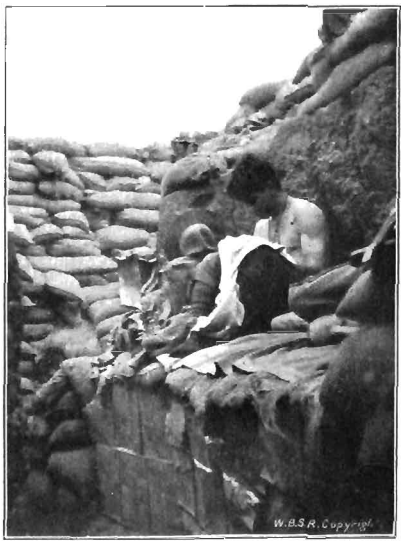


FIG. 119. PRIMITIVE METHOD OF REMOVING LICE FRONT LINE TRENCH, ANZAC

climb up to it every time soldiers' kits have to be popped into it (Fig. 120)? Again, why do so many people neglect to see that the water-tank, the source of steam, is so placed below the barrel that the largest available evaporating surface is provided? Success in sanitation depends largely on attention to detail, and very often this is not forthcoming.

The so-called Levisseuse apparatus, which is a kind of metal Serbian barrel, has such a limited holding capacity that it is not much use.

FIG. 120.—SERBIAN BARREL WRONGLY PLACED, MAKING IT DIFFICULT TO INSERT KIT IN THE BARREL OWING TO HEIGHT ABOVE GROUND LEVEL

Barrel for disinfectant

A barrel may be used for holding disinfectant outside a latrine (*see* Fig. 114, *page* 126). It should be accompanied by a nail brush fastened to a wire. One medical officer actually arranged a latrine in such a way that once in it you could not emerge without dipping your hands in a disinfectant solution which effectually camouflaged the latch of the door. I fear the plan was more ingenious than effective.

A very insanitary makeshift for getting rid of dead animals on the road was too often in vogue in East Africa, namely, leaving them there till the flies and the vultures made an end of them. I show you the picture of a carcase where, it is true, an effort at charring had been made, but in which the main disinfection was that whereby Herod Agrippa ceased to be a nuisance, for this dead horse was being "eaten up of worms," or rather by the maggots of Pyrenosoma flies (Fig. 171). Wayside carcases

FIG. 171.—CARCASE OF A HORSE LEFT AT THE ROADSIDE, EAST AFRICA

Fly Destruction

Cage fly-trap

I do not like to call any invention of my own a makeshift, but would direct your attention to the open-air cage fly-trap (Fig. 122) which has been modified by Captain Rose. Both the models work well when properly baited and operated. This is not the case when medical officers construct them so as to catch sparrows as well as flies, or alter them according to views which effectively ruin their efficiency, or pay no attention

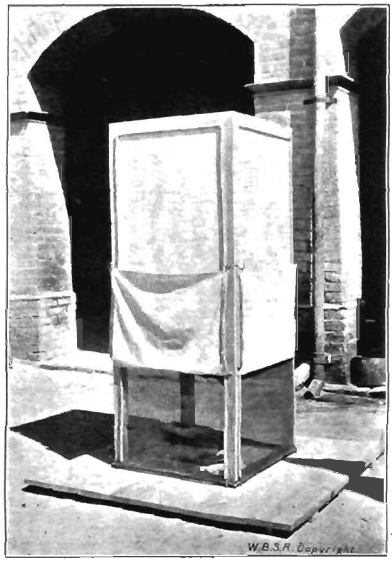


Fig. 122. Type of Cage Fly-trap in use at Basra

to them after the first excitement of trapping several thousand flies is over. Here are the rules which must be followed if these traps are to be a success:—

1. The calico or canvas forming the greater part of the sides of the trap should be stretched *tightly* on the framework.

2. The slit between the wire mesh and the alighting board should be just large enough to allow a blue-bottle fly to enter the trap.

3. The trap should, as a rule, be placed in the sun out in the open.

4. It should be placed outside a mess or cook-house, or near a latrine, or between an occupied tent or camp and any source of flies. Rules for cage fly-trap

5. It is essential that it should be properly looked after, especially as regards baiting.

6. For this purpose it is best placed under the charge of some one person who will be responsible for keeping it in repair, baiting it properly, and cleaning it.

FIG. 123.—A SIMPLE METHOD OF LOUSING EMPLOYED BY INDIAN TROOPS, AMARA

7. Any attractive bait may be employed, but one of the very best is chicken entrails. Human faeces may be used if placed in a tin carefully covered with wire gauze, so that the flies cannot get access to the contents. Other baits are: raw meat, cheese paste, stale beer, bread soaked in vinegar water, jam, marmalade, lentil paste with a little sugar sprinkled on it, old melon rinds, fruit and fish refuse.

Flies poisoned

8. Flies in the trap are best killed by a solution such as formalin 1·5 to 2 per cent. made up with lime water, arsenite of soda syrup, or sodium fluoride. Whatever poison is used it is best placed in a covered tin through the lid of which wicks protrude. These wicks dip down into the fluid or syrup, which they suck up, and the flies imbibing the poison from them speedily die.

9. Failing poison, the flies can be killed by spraying with spray oil or some similar preparation, or by fumigation, the trap being covered over with cloths or blankets during the fumigating process.

10. A record should be kept of the daily catch. This may be done by weighing the flies or seeing how many will go into a receptacle of known capacity. A pint measure holds about 10,000.

Arched fly papers

It is perhaps news to many that a tangle-foot fly-paper is much more efficient if used in the form of an arch; sticky surface, of course, upwards (Fig. 124). This has probably

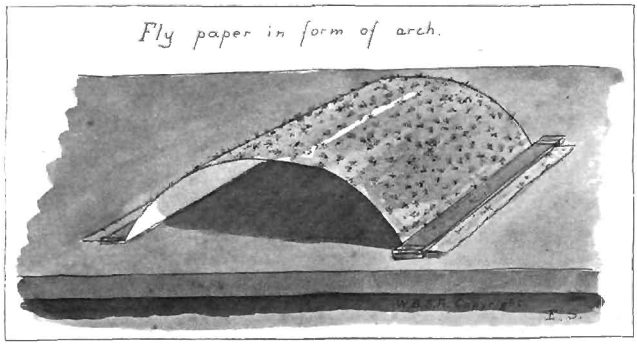


FIG. 124.—THIS ARCHED FORM OF FLY-PAPER IS FOUND TO SERVE AS A MORE EFFICIENT TRAP

something to do with the way the light falls upon it, and an apparatus has been devised for holding such curved papers.

Roller-towel method

The roller-towel method of using arsenite of soda solution is an excellent makeshift arrangement, and, with a minimum of attention, ensures a constantly damp, poisoned surface for the delectation of our enemy the fly (Fig. 125).

At Nasiriyeh, on the Euphrates, Major PATTEN, I.M.S., had introduced ROUBAUD'S method for destroying fly eggs and larvæ in horse manure, and the remarkable mounds shown (*see* Fig. 126, *page* 136) are the result of his efforts. The heat of the manure is used as a lethal agent. Another device, which served to free a large hospital at Roubaud's method

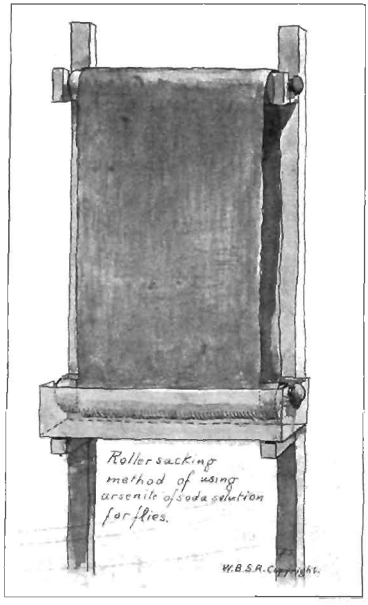


FIG. 125. THE TROUGH IN WHICH THE SACKING DIPS CONTAINS THE POISONED SOLUTION

Potchefstroom altogether of flies, was introduced by Lieutenant BABER, S.A.M.C., and has been described in the *Lancet* for March 30, 1918. Here the larvæ migrating from the heap were trapped in gullies and destroyed, and any flies which happened to breed out found leafy branches soaked in arsenite solution conveniently placed for their refreshment and rest—the latter of the eternal variety. Baber's method

FIG. 126.—ROUBAUD'S METHOD FOR THE DE-TRUCTION OF FLY EGGS AND LARVÆ, SHOWING MOUNDS OF MANURE

Grill and other Incinerators are also in evidence

FIG. 127.—EXTERIOR OF FENESTRATED MUD-BRICK MOSQUITO- AND FLY-PROTECTED WARD, OF NO. 130 COMBINED FIELD AMBULANCE ON THE ROAD NORTH OF JAFFA

Designed by Lieut.-Colonel OTWAY, R.A.M.C.

Buildings

Lastly, a few words as to buildings. By far the most ingenious makeshift hospital ward I ever saw was the fenestrated mud-brick erection constructed by Lieut.-Colonel Otway, R.A.M.C., of the 130th Combined Field Ambulance, on the road running north from Jatta.

I show you an external view (Fig. 127).

Thanks to the use of mosquito mesh on the inner side of the fenestrations, and also over the doors and windows, this ward was absolutely free from flies and mosquitoes. It was partly hollowed out of the ground, but the portions left as bedsteads were of such a height that the patients lying on them could look out of the ward and see all that was passing. There was plenty of light and yet it was refreshingly cool. As I say, I never saw anything like it, and it deserves very honourable mention.

New type of hospital ward

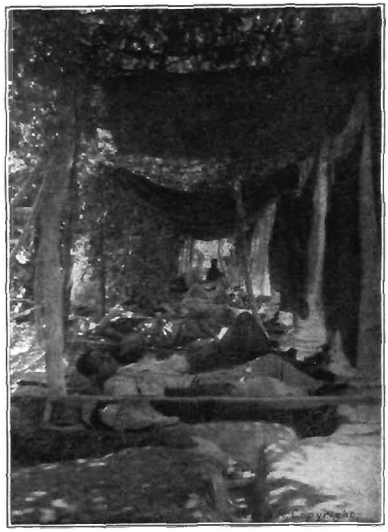


Fig. 128.—Part of 124th Indian Cavalry Field Ambulance, Jordan Valley
Showing Sick under Grape Vine in Monastery

Some of the thatched bandas used as wards in the carrier hospitals in East Africa were truly works of art. Those in No. 1 Carrier Clearing Hospital at Iringa were really beautiful buildings, and most comfortable, reflecting the greatest credit on Major Roberts, R.A.M.C., and his experienced architect, Staff-Sergeant Eales, S.A.M.C.

Carrier hospitals in East Africa

A trellised grape vine in a monastery close to the Jordan formed quite a good makeshift ward for the patients in an Indian Cavalry Field Ambulance (Fig. 128), while I would direct attention to the curious little shelters for cerebro-spinal contacts employed at Dodoma in East Africa (*see* Fig. 129, *page* 138).

A method of warming a tent by a stove and chimney was in use on the Karun Front in Mesopotamia; and, at Amara, the remarkable huts of the British Convalescent Depot dug out of the soil, roofed with reeds and provided with

Amara Convalescent Depot

lateral ventilating shafts, were admired by all who saw them, and used by as many as could get into them (*see* Fig. 130: *also* Fig. 131, *page* 140).

Finally, I may remark that no one who was ever inside the famous sand-bag bacteriological laboratory, tucked away out of shell-fire at the base of the cliffs at Cape Helles (*see* Fig. 132, *page* 141), is likely to forget it; and that the remembrance of the huge packing-case which had once held an aeroplane, doing duty at Dar-es-Salaam as a hospital laboratory, is not likely to fade.

I think I have said enough to prove that the army sanitarian has plenty of ingenuity, even if it is at times wrongly applied. Believe me, he has need of it, for he is often left

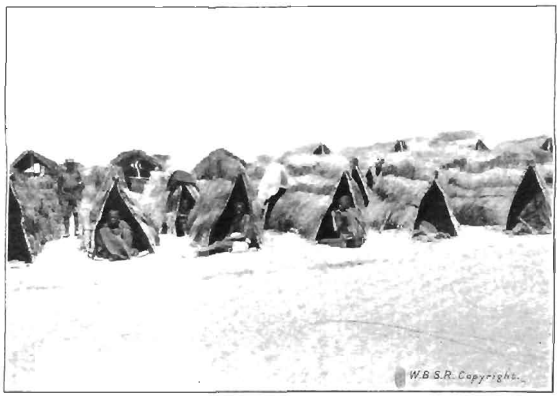


Fig. 129. Separate Hut Shelters for Cerebro-Spinal Fever Contact Cases, Carrier Hospital, Dodoma, East Africa

in the lurch. Why is this the case? There are several reasons, but one is that the sanitarian has to go cap in hand to the Ordnance Department or the Royal Engineers and beg for material. Sometimes he will get it at once: sometimes after a long time: very often not at all.

Let me tell you a true story which speaks for itself:—

A New Zealand medical unit on a certain island was badly in need of wood for sanitary purposes. Requisition after requisition failed. Finally, the Commanding

Officer said to his Quartermaster: "I want you to indent on the Ordnance for a large supply of wood to make tombstones!"

"Tombstones!" said the Quartermaster: "what do we want with tombstones?"

"Never you mind," was the reply: "do as I tell you."

The quick and the dead

Next day a cart, laden with wood of all shapes and sizes, made its appearance. There was plenty for the dead. There was none for the living.

Naturally enough the Engineers, a very busy and capable corps, scarcely realise the paramount claims of sanitation. Like Martha, they are occupied with many things, and latrine construction does not usually appeal to them, nor do they always understand what

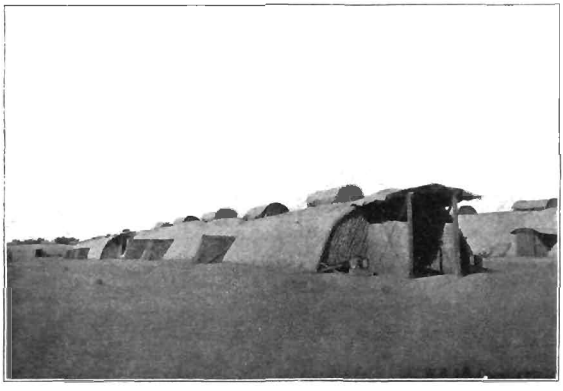


FIG. 130.—EXTERIOR OF TYPE OF HOSPITAL HUT AT THE BRITISH CONVALESCENT DEPOT, AMARA

These huts of reed and chatai matting are hollowed out in the ground to a depth of four to five feet. Lateral openings provide light and air. They are comparatively cool in summer

is meant by efficient protection of a water supply. As I have said elsewhere, things will not be right until the Royal Army Medical Corps has affiliated to it a body of expert sanitary engineers, under its own control, to carry out the minor sanitary works which are so important. I know there are difficulties in realising such a scheme, but I believe they can be overcome.

Sanitary *Engineers*

In common with many of you, I have the honour to belong temporarily to the Royal Army Medical Corps, and I have seen again and again how the efforts of that

Corps are frustrated by its dependence on other departments. Too often it gets the blame when it is not blameworthy. Grant it a greater measure of autonomy and you will see what it can do.

The doctor as an administrator

They say medical men are not, as a rule, good administrators. I deny that assertion. What are the qualities of a good administrator? Foresight, tact, discretion, firmness, energy and sympathy. What is prognosis but foresight? What is tact if a doctor does not learn it in dealing with his patients? Discretion is surely drummed into the medical man from his student days. He may not always be firm, but his experience at least teaches him to stiffen his back if he is to save life. Few men lead more energetic lives than the medical student, while sympathy is surely the hall-mark of our profession.

No, the doctor can administer if only he gets a fair chance.

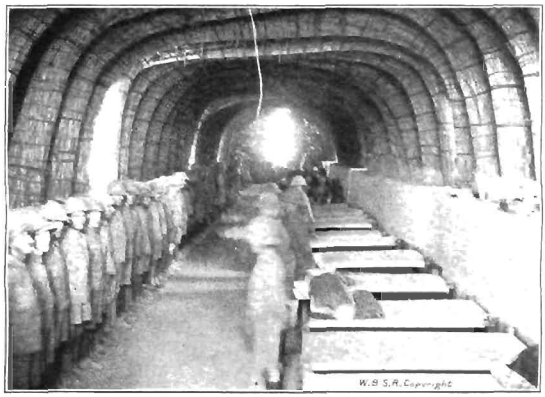


FIG. 131. INTERIOR OF TYPE OF HOSPITAL HUT AT THE BRITISH CONVALESCENT DEPOT, AMARA

These huts of rêed and chatai matting are hollowed out in the ground to a depth of four to five feet. Lateral openings provide light and air. They are comparatively cool in summer.

Plea for better recognition of army hygiene

At the same time, I do not think that hygiene is yet priced at its proper value. I would advance a plea—an urgent plea—for its better recognition. Rightly or wrongly decorations play a great part in army life. When a regular officer is introduced to a stranger in khaki, in nine cases out of ten his eye wanders first to the spot where what has been called the "herbaceous border" flourishes! He will never there see anything associated with sanitary work—I mean it has no distinctive reward. Comparatively rarely indeed has it any reward at all.

And yet the disciples of the goddess Hygieia—be they in the humblest or the highest positions—contribute greatly to the success of our arms, more especially in tropical countries. They have hard work, constant work, often dirty, dangerous and repellent work.

Doubtless it is sufficient honour and reward to labour for the sake of the Empire; but when so many distinctions are conferred, is it asking too much that the claims of the sanitarian should be considered, not, mark you, for his own sake, but to impress upon

FIG. 132.—SAND-BAG BACTERIOLOGICAL LABORATORY AT BASE OF CLIFFS, CAPE HELLES

those ultimately responsible the fact that army hygiene is a very important section of army life?

Our friends the French are a wise and practical people—the French army has such a distinction. I understand it has been cheapened; but I maintain the principle is sound, and the recipients of any such honour should not be limited to the Medical Service, but

French decorati

should be chosen wherever an officer or man has shown conspicuous zeal and energy furthering sanitary measures.

White for purity; blue for hope

There are many other questions of pay and rank, and, I may add, as far as sanita sections are concerned, of mobility, but into these I may not enter.

I would only say that if ever the above suggestion—which I advance with considerat diffidence, and only because I am certain it is on right lines—if ever, I say, it bears fru then I hope the ribbon chosen for the decoration will bear the same colours as the fl of which I spoke—the white of purity, the blue of hope.

THE PROBLEM OF HYGIENE IN EGYPT

Being the Chadwick Lectures delivered on May 22, May 29, and June 5, 1919

LECTURE I.—THE CAUSES OF THE PROBLEM

EGYPT is the hub of the wheel of Empire. The importance of that ancient land is fully recognised from a military, political and commercial standpoint. It has bulked largely in the world's history, and recent events have certainly not tended to diminish its status in those directions. It is, however, doubtful if, in this country at least, the significance of Egypt from a hygienic point of view is equally realised. And yet in what may be called "Imperial Medicine," Egypt must ever play an increasingly important rôle. The hub of the wheel of Empire

EGYPT AS AN INTERNATIONAL FILTER

She lies at the gateway to the East, the Suez Canal traverses her territory, she acts as a great filter—a filter for disease. This filter, however, differs markedly from others with which we are acquainted, for the filtration it effects is a double one. It protects Europe from such diseases as plague and cholera, ship-borne from India, Mesopotamia, Arabia and ports on the western Red Sea littoral; and it guards these countries and places from the risk of infection coming from Southern Russia, the Levant, and various foci in the Mediterranean. In days to come there will be few more important quarantine stations than Suez, while Port Said and Alexandria keep watch and guard on vessels hailing from north and east and west. Egypt as a filter

Although constant vigilance has to be exercised, no great strain is imposed upon those responsible, save at the time of the Mecca pilgrimage, when the migrations of the faithful occasion the utmost alertness. More especially is this the case when the pilgrimage is declared "brut," or infected. The term "brut" is a French word which has various meanings, such as rough, raw, crude and so forth. It also signifies "void of reason," and seems almost to have been adopted on account of this meaning, for there is nothing about it to denote infection. In all probability, it was employed merely as a convenient term, the antithesis of the French "net," and one with which the pilgrimage could be discreetly labelled, even if infection was merely suspected, not absolutely proved. When such a label was affixed the problem became one of much anxiety. Picture to yourselves the conditions of the Hedjaz. Vast throngs of people, often ill-fed and ill-clad, crowded together at such a pestilential port as Jeddah; an assemblage polyglot in the extreme and hailing from every quarter of the Moslem world, a concourse in some The Mecca pilgrimage

respects cleanly in its habits, thanks to the Mohammedan ritual, but ignorant of eve law of modern hygiene: a great gathering which, having completed its devotions the Prophet's shrine, was intent on one thing only—to return home as quickly, cheap and easily as possible.

While this was true of the majority, it is interesting to note that, owing to th difficulties of travel in the Hedjaz in pre-war days, many pilgrims, after travelling by th railway to Medina, actually made for Egypt and then started off for Mecca, a curio roundabout way of attaining their goal, and one which introduced fresh sanita complications. In any case, the crowded port was followed by crowded steamers where the pilgrims were packed almost like tinned sardines, for the voyage is short and th restrictions are none too stringent. Amongst this mass of humanity, sweltering in th heat of the Red Sea, plague or cholera might make its appearance and begin to claim i victims. The ship is then infected and is a danger to Egypt a problem to be solve Yet, again, she may merely hail from an infected port and require watching for a certa period—*a different proposition*.

Pilgrims by road, rail, and sea

But all pilgrims did not reach Egypt by the southern sea route. You are famili with the Hedjaz railway, which has played so notable a part in the war. Formerly *played an equally important rôle as regards the Mecca pilgrimage, and the trains were,* the time of the Haj, thronged with a multitude travelling, as CLEMOW has describe in open trucks or luggage vans. Amongst them were Egyptians, who often chose th route for their return journey and eventually reached the sea at Jaffa, Haifa or Beyrou whence they took ship to Egypt, avoiding to some extent the restrictions placed upo those travelling via the Red Sea (Fig. 133).

So much for the rôle of Egypt as an international filter. The measures taken to de with the problem of sea quarantine will be considered in due course, but it must l remembered that the war has introduced a new factor into the sanitary problem arisi out of the relation of Egypt to her neighbours. This new factor is the railway linking th Nilotic territories with Palestine. Prior to the war the question of land quarantine wa one of little importance. To the west lay Tripoli, separated from the populous lands o the Delta by a great desert, which was seamed only by caravan routes and uninhabite save by wandering Bedouins, and where scattered oases afforded water and means of lif In the south, Egypt merged with the Sudan, and there was more danger of the latte being infected from Egypt by way of the Nile than there was of Egypt being infecte from the Sudan. Eastwards lay the desert of the Sinai Peninsula, an effective barri between the Suez Canal and Syria.

The railway to Palestine

Now, as by the stroke of an enchanter's wand, all is changed so far as this easter frontier is concerned. An iron link has been forged, a link potent for good and evil, an in a few hours the traveller passes from the sands of Egypt to the mountains of Jude It is conceivable that, in the near future, yet a third form of quarantine may have to b instituted, as there is every likelihood of Egypt becoming a halting-place for grea airships *en route* from India to Europe.

Interesting as are these questions of aerial, land and maritime quarantine, it mus be understood that the main problem of hygiene in Egypt centres in the intern condition of the country.

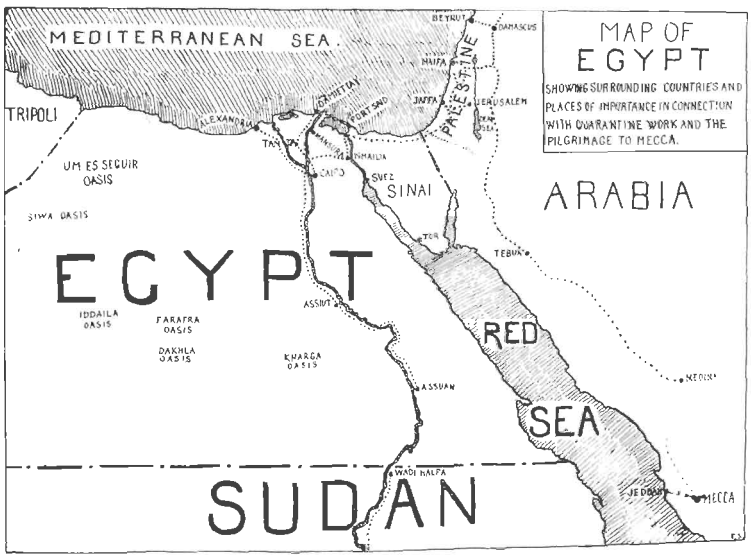


Fig. 133—Map of Egypt

Mediæval Sanitary Conditions

In the first place, it is necessary to remember that, so far as the great mass of the native population goes, sanitary conditions may be described as mediæval. In the second place, one must not forget that all that really counts in the Egypt of to-day is artificial. The country, as we know it, is the product of man's activity. Egypt is so very old that it is difficult to get beyond a period when man was not busy modifying it to suit his needs, but doubtless at the beginning the land was one huge desert with fertile strips bordering the Nile—strips dependent on the annual rise and fall of the great river. Then came man and harnessed the water to his uses. While, owing chiefly to the configuration of the land, he has not created any great change in Upper Egypt, he has established the green Delta with which we are now familiar—a Delta which in many respects is a hotbed of disease. Irrigation, while conferring the greatest benefits on the land of the Pharaohs—while, in reality, creating modern Egypt—has been by no means an unmixed blessing, for closely associated with it are the two great worm diseases—ankylostomiasis and schistosomiasis (bilharziasis)—which have produced such dire effects upon the fellaheen.

Man and the Delta

Considerations of climate enter little into the problem of hygiene in Egypt, for such influence as the climate exerts is largely of a beneficial nature, though it should be noted that the climatic conditions at certain seasons of the year are singularly favourable to the propagation of flies, and hence to the dissemination of such diseases as enteric fever and dysentery.

The race, and more especially those fellaheen of whom we have spoken, constitutes a very important factor in the health problem. Who are these brown-faced, blue-garbed sons of the soil? They constitute the immense majority of the population; they form the lowest stratum of the social organisation of the country; they are the descendants of those who, until Great Britain undertook the work of reformation in Egypt, were beaten and robbed, the prey of pashas and of usurers. Physically they are a sturdy race, and, as Lord Cromer has stated, when left to themselves, kindly and even jovial. These characteristics are more marked in the people of the Delta, those of Upper Egypt being somewhat truculent and less easy to handle. Unhappily, from a hygienic standpoint, the fellaheen are also steeped in ignorance and superstition, void of initiative, with no outlook, with little ambition, content with the daily round of labour in the fields, and in many cases doomed to suffer much misery from preventable disease. As a recent Commission[1] has said, and truly said: "To-day the greater part of Egypt is filthy, and no self-respecting populace can be raised in filthy surroundings. As of old, Egypt is plagued by disease, and it is hopeless to expect a disease-ridden people to play their proper part in furthering the welfare of their country. The infant mortality of Egypt is appalling—actually one-third of the children born dying in infancy. The verminous condition of the fellaheen shows no improvement, though lice are now known to be conveyers of typhus and relapsing fevers, which account for so many deaths." And, again, when speaking of the necessity for education and for improvement in village sanitation, it is stated that "the healthy fellah is happy and content because he has never known anything better, while the

The racial factor in the health problem

Infant mortality

[1] *See* footnote on page 180

unhealthy fellah is far from being happy and content, though he is, perhaps, the most patient of sufferers."

It is, indeed, this quality of patience, an almost bovine patience, which is one of the chief features in the character of the fellaheen; but, so far as disease goes, there is a kind of hopelessness about it which is pathetic. Especially is this true of the women, who, in contrast to the men, wear black garments. Now black is the colour of mourning, and well may it be worn by the women of the fellaheen, for their lot, from a medical and sanitary standpoint, is too often a sad and weary one. I propose to consider the problem of the women first, for in eastern countries questions of health are very intimately bound up with the state of the female population. Happily, the poorer women of Egypt, be they fellaheen or town dwellers, have not lacked champions in the past. Their most energetic and scientific supporter of late years has been Mrs. ELGOOD, a lady doctor who has laboured incessantly to improve their lot, and who, as Medical Officer to the Ministry of Education, has also fought the battle of the children.

Dr. ELGOOD has pointed out that there must be at least 4,000,000 women in Egypt of child-bearing age. The general methods of midwifery she describes as archaic and brutal. No one knows how much puerperal fever occurs, but, taking Cairo alone, it is significant how many funeral biers are seen in the streets with silver bridal tresses adorning their head-pieces, the sign that a woman has died during her first year of married life. In any case, there can be no doubt that, apart from other ailments, the majority of lower-class Egyptian women suffer from uterine and ovarian complaints. Gonorrhœa is exceedingly common, syphilis far from rare, while the mental effect produced by the frequent loss of children must tend to depress vitality and induce apathy and despair. The harem system makes the problem of succouring these women difficult, though not hopeless. Naturally enough, they and their husbands object to male assistance, and, even at out-patient clinics, to the presence of male students or of "tamurgis," as the male hospital orderlies are called.

Archaic methods of midwifery

According to Dr. ELGOOD, the absence in most Government hospitals of a European matron or a woman doctor prevents the lower-class men entrusting their women to the care of such institutions. Another condition which leads to difficulties is the treatment of prostitutes in Government hospitals. So long as this class is admitted to the same building as the honourable women, so long will the latter object to being treated there, even though the prostitutes are housed in special wards.

Lastly, there is the question of hospital fees. Small though these are, they are prohibitive, for many of the working-class Egyptians are miserably poor. There is a rule that the very poor shall not be charged, but nearly all who attend hospital are in this state, for it is the last resort of the destitute. At the present time most of the maternity assistance in Egypt is rendered by dâyas or midwives, poorly-trained women of a low and dirty class, who are responsible for many of the deaths, both of mothers and infants. In addition a certain number of hakimas or, as they are more usually termed, mumarridas, exist, to whom further reference will be made when we consider the solving of this part of the Egyptian health problem.

Poverty of working-classes

Healthy children are a nation's greatest asset, but how can the poorer Egyptian children be healthy when their mothers labour under the disabilities we have just

Effect of the mothers' disabilities on the child population

considered, and are, in addition, dirty and ignorant? A third of them die as infants. Those who survive, especially if in the large towns, have a struggle for existence. A great number attain adolescence exhibiting some defect. Many harbour ankylostomes or schistosomes, or both, and suffer grievously in consequence. A large percentage are infected with other helminths, many have damaged eyes, some are cripples, others have splenomegaly, often combined with hepatic cirrhosis. Yet others acquire pellagra. Not a few are disfigured by smallpox, and probably a minority become healthy men and women. Yet there is no instruction in diseases of infants and children at the Kasr-el-'Aini

FIG. 134.—A SMALL EGYPTIAN TOWN

School of Medicine, the only institution in Egypt granting diplomas to practise the healing art, and the facilities for the gratuitous treatment of infants and children are woefully inadequate, save possibly where eye diseases are concerned.

How the fellaheen live

We have digressed a little from the subject of the fellaheen, but, returning to them again, let us see how they live and labour and what ideas they possess as regards the cure and prevention of disease. They inhabit villages which, though often picturesque, transgress wellnigh every law of health; congeries of flat-roofed, ill-ventilated mud

dwellings, some of them partly underground, crowded like rabbit warrens, and where the houses are shared alike by man and his domestic animals—donkeys, cattle, buffaloes, sheep, goats, cats, dogs, rabbits, fowls and pigeons. The roofs are usually piled high with grass or rubbish, and commonly serve as latrines for the women of the household. The lanes or passages between the houses are narrow, often tortuous, and not infrequently blocked by stacks of manure. There are many blind alleys. There is no sweep of purifying air. No sanitary conveniences of any kind exist, but rats swarm, and at certain periods there is a plague of flies. Hard by there is often a birka or pool which may serve as a mosquito nursery, and the water of which, frequently used for drinking purposes, is generally grossly polluted. It may harbour the infected snail hosts of the schistosomes and be a danger to those bathing in it. The usual source of water supply is a canal into which all manner of filth finds its way and in which buffaloes love to soak themselves (*see Frontispiece*). Villages. Birkas.

The larger villages, if judged by the number of their inhabitants, might well be regarded as considerable towns, and may contain better-class houses in which the wealthier landowners live (Fig. 134). Most of the fellaheen, however, are small proprietors subsisting on the produce of their fields. Apart from the presence of disease and deformities, their lot under British rule is by no means a hard one, and certainly compares favourably with that of the poor of the congested towns, into which the rural population tends to flock, thereby creating one of the most serious of the sanitary problems that have to be faced. There is no room for the newcomers, adequate building schemes to cope with the difficulty are non-existent, and the result is overcrowding with all its attendant ills—evils accentuated in a land where the lower orders are infested by vermin, and where the plague-carrying rat-flea abounds. Congestion of towns.

One has no wish to paint too gloomy a picture of Egyptian life. There is much in it that is cheerful and attractive, at least in the country districts. The ravages of disease are not very apparent to the casual observer. It is true he cannot fail to be struck by the number of blind persons or unfortunates with defective vision; he may notice that deformities are common, and occasionally be shocked by the sight of a wretched leper, but otherwise he would probably regard the populace as strong and well-liking. It is not until one studies statistics, visits the dispensaries and hospitals, becomes familiar with the asylums and homes for incurables, inspects the slums of the great cities and is brought into contact with epidemics that one appreciates how great a burden of suffering and inefficiency is borne by the populace of Egypt, and how much of this burden is preventable.

Take the work of the fellaheen (*see* Fig. 135, *page* 150), work with the primitive plough and the fass (hoe or spade) in the irrigated fields, work which entails walking or standing ankle- and knee-deep in the alluvial mud. Owing solely to the pollution of the soil with human excrement, there is an ever-present risk of infection with the larvæ of ankylostomes, resulting in that hookworm disease of which, thanks to the Rockefeller Institute and its campaign, we have heard so much of late years. Polluted soil.

Again, either in the course of his work or when bathing or washing or drinking, the fellah is often brought into contact with water which, owing to pollution with urine or fæces, is charged with the cercariæ of one or other of the human schistosomes, and in many

cases he falls a victim to schistosomiasis. Both schistosomiasis and ankylostomiasis are serious diseases which can be prevented by suitable hygienic measures, and the same is true of many others. It is easy to proclaim this fact, but in order to tackle preventable diseases properly it is highly desirable to enlist the sympathy and support of the populace who suffer from its effects. Such is no easy task, even amongst an educated community. The native Egyptian, however, is still plunged in abysmal ignorance as regards the nature and cure of disease. Lord CROMER in his book, "Modern Egypt," quoting from an interesting paper written by the late Dr. SANDWITH in 1884, cites several

Abysmal ignorance and its results

FIG. 135.—A FELLAHEEN FAMILY

instances of strange superstitions, which showed that the medical knowledge amongst the poorer classes was not materially in advance of that current in the days of the Pharaohs. Here is one not quoted, but culled from the same authority. Numerous alleged cures exist for ophthalmia, "such as wearing a red bead or gold ornament on the forehead, or rowing across the Nile at Cairo to deposit a lump of mud on the further shore. During the process of some of these cures it is considered most important that the eyes should not be washed for 40 days, and it is not uncommon to see children with both eyes completely covered with a dry scab which the parents refuse to have removed, although pus may be streaming down the child's cheeks."

The leaven of education

It is to be feared that in the thirty odd years which have elapsed since Dr. SANDWITH collected these curious beliefs there has been no very great change, though, doubtless, there has been some lessening in this ignorance and credulity, for the leaven of education has been at work, new ideas are abroad, and the doctor is more trusted than he used to be.

The Conditions in Urban Areas

Hitherto we have been considering chiefly the rural districts and the fellaheen. Let us take a look at the urban populations and at the conditions which exist in such great cities as Cairo and Alexandria. I cannot do better than quote Lord Cromer's vivid description of the first ten people a visitor to Cairo may happen to meet in the streets of "that maze of old ruin and modern café, that dying Mecca and still-born Rue de Rivoli," as it was christened by Sir William Butler: — Cairo

> "The first passer-by is manifestly an Egyptian fellah who has come into the city to sell his garden produce. The headgear, dress and aquiline nose of the second render it easy to recognise a Bedouin who is, perhaps, come to Cairo to buy ammunition for his flint-lock gun, but who is ill at ease amidst urban surroundings, and will hasten to return to the more congenial air of the desert. The small, thick-lipped man with dreamy eyes, who has a far-away look of one of the bas-reliefs on an ancient Egyptian tomb, but who Champollion and other savants tell us is not the lineal descendant of the ancient Egyptians, is presumably a Coptic clerk in some Government office. The face, which peers somewhat loweringly over a heavy moustache from the window of a passing brougham is probably that of some Turco-Egyptian Pasha. The man with a bold, handsome, cruel face, who swaggers by in long boots and baggy trousers, must surely be a Circassian. The Syrian money-lender, who comes next, will get out of his way, albeit he may be about to sell up the Circassian's property the next day to recover a loan of which the capital and interest at any ordinary rate have been already paid twenty times over. The green turban, dignified mien, and slow gait of the seventh passer-by denote some pious Sheik perhaps on his way to the famous University of El-Azhar. The eighth must be a Jew, who has just returned from a tour in Asia Minor with a stock of embroideries, which he is about to sell to the winter tourists. The ninth would seem to be some Levantine nondescript, whose ethnological status defies diagnosis; and the tenth, though not easily distinguishable from the latter class, is in reality one of the petty traders of whom Greece is so prolific, and who are to be found dotted all over the Ottoman dominions. Nor is the list yet exhausted. Armenians, Tunisians, Algerians, Soudanese, Maltese, half-breeds of every description, and pure-blooded Europeans pass by in procession, and all go to swell the mass, if not of Egyptians, at all events of dwellers in Egypt."

Naturally this mixture of races adds to the difficulties of the sanitarian, which have been further enhanced by the existence of the capitulations. These were at first really concessions or privileges granted by Turkey to foreigners resident in Egypt, but under the lax rule of the Khedives the privileges grew into abuses, multiplied in various directions, and became a curse to the country and a great bar to sanitary reform, because many of those who offended against the public health could not be brought to book. Happily, the capitulations are now on their last legs, but they have wrought untold harm for many years. The capitulations

This is why in Cairo so many of the so-called *établissements insalubres*, really offensive trades, thoroughly deserve their title; this is one reason why it has been so difficult to deal with the mosquito pest; this has been one of the causes which have wellnigh broken the heart of the energetic Medical Officer of Health in his struggle to abate nuisances and secure convictions.

But the capitulations are by no means the sole reason why Cairo has a high death-rate — and in many parts is insanitary in the extreme. In 1911, in a well-known medical work, there appeared the following criticism, which gave rise to much heart-burning in

Cairo in 1911

certain quarters. After commenting on the cesspools, the mosquitoes, the sewages *sodden soil, and the vermin of the Egyptian capital*, the writer goes on to say :—

> "The human mortality is enormous, especially the infantile mortality. The figures supplied by the Public Health Department are unreliable (as I know, for I have assisted to compile some of them). The actual population is unknown, many deaths are probably never reported, *and sickness is not usually notified. All deaths are supposed to be registered, the diagnosis* usually being made by a brief inspection of the dead body. Doctors will not notify disease, because they say that it ruins their practice. Landlords prefer to knock holes in the sides of their cesspools and allow the sewage to flood their cellars and basements rather than go to the expense of having them pumped out. The water-supply is not the best obtainable, the streets are not properly cleaned, and enormous heaps of dung and rubbish have been allowed to accumulate for years past on the outskirts of the city. Many of the streets are not metalled, which perhaps is a good thing, for the rough surface acts as a sponge for the stale urine which would otherwise collect in puddles. Dung and street refuse are used as fuel generally; and large collections of this rubbish are kept for this purpose on the roofs of the 'Turkish baths.' Nearly all the dogs have been destroyed owing to outbreaks of rabies, and many cats have taken their place as natural scavengers. Hordes of flies, which breed in the dung and rubbish, abound everywhere, and are nearly as great a nuisance as the mosquitoes. Without exaggeration, Cairo may be described as a city which is hardly fit for habitation, and at present it must rank with Moscow, Pekin and Hankow as being one of the most insanitary spots in the world."

Happily, there has been in some directions a considerable change for the better since the above appeared.

I myself recall an incident which opened my eyes as to the insanitary state of affairs permitted to exist in a city the European part of which almost merits the old title of Cairo the Magnificent, so far as spacious streets and fine buildings are concerned. A certain Sewage Transport Company approached me with a view to obtaining a concession for dealing with the conservancy of Khartoum. I met the Company's representatives in a very ramshackle and decayed building in Old Cairo. As is usual in Egypt, coffee was served, and, on finishing my cup, I discovered amongst the syrup at the bottom of it a dead fly. I fear this prejudiced the Company's application from the outset; but, in any case, it could never have been entertained, for the ideas advanced were, to say the least, unprogressive, and the methods of working in Cairo were disgraceful. Pail contents were collected in those insanitary juggernauts called Crowley carts (*see* Fig. 5, *page* 27), which jolted and splashed along the unpaved, badly-kept roads, to the joy of thousands of flies which bore them company. The cart contents were dumped into shallow open depressions in the soil no great distance from the city confines, and were there mixed with material, dug from the neighbouring gebels, which is said to have fertilising properties. The nauseous mixture, after drying in some measure, was spread *out on top of these same gebels for further desiccation. Naturally it pulverised*, and naturally the south wind wafted it down upon the city. Is it possible to imagine a more filthy and insanitary procedure? Is it strange that sore throats are frequent in this city of dust and smells? These methods are still in vogue, for the great drainage scheme has not yet touched Old Cairo, and, though there is better supervision, the conditions remain very unsatisfactory. One has only to read the report of the Sanitary Commissioner sent out by the *Lancet* in 1908, to realise how necessary it was, and still is, to cleanse the Augean stable. He paints a lurid picture of the rubbish heaps to the

Insanitary Old Cairo

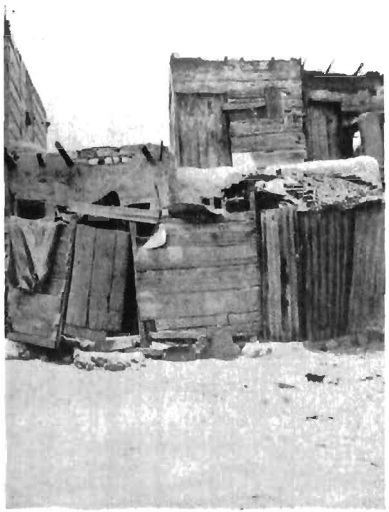


FIG. 136.—A HOTBED OF TYPHUS FEVER, SIDI EMAD
CAPTAIN SIBLEY, R.A.M.C.

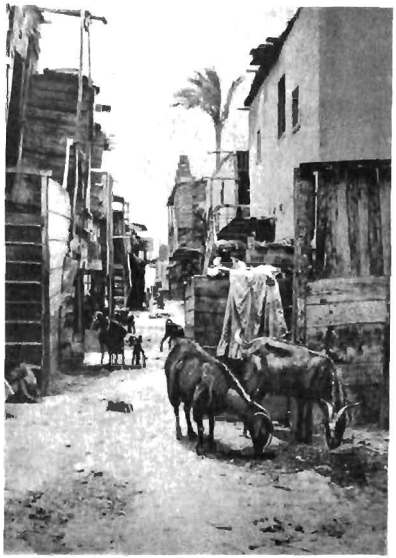


FIG. 137. SUBSTANTIALLY-BUILT HOUSES ON RIGHT. CORNER OF A LARGE COLLECTION OF ECHÈCHES ON LEFT. RUE IBRAHIMIEH. EZBET TANIL
CAPTAIN SIBLEY, R.A.M.C.

north of the city, and, though things have improved in some measure, a good deal yet remains to be done. Elsewhere, amongst the tangle of narrow streets in the Bulaq, Saida Zeinab, and Bab-el-Sharia quarters, all manner of insanitary conditions continue to flourish. The meat market is very far from ideal, the tripe market an abomination. Many of the cowsheds and dairies are filthy in the extreme. The roofs of the houses are used as latrines, the condition of the wells in their basements is enough to suggest cholera.

Markets

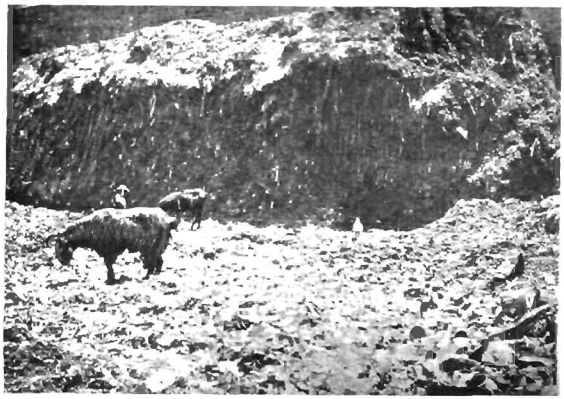


FIG. 138.—HEAP OF DRYING STREET SWEEPINGS, USED AS FUEL BAB SIDRA.
CAPTAIN SIBLEY, R.A.M.C.

Filth and flies, overcrowding, vermin, infected food and drink, stagnant air, disease and destitution, all are there. Is it any wonder the Sphinx sits yonder in the desert and gazes with stony and sardonic smile over a city with a death-rate of nearly 40 per 1000 per annum?

Death-rate

But, you will say, after all Cairo is a great and ancient native city, an eastern city, and we know what happens to the man who tries to hustle the East. Let us then take train to Alexandria, which is largely a European city, a proud and prosperous city with a municipality and, *mirabile dictu*, wellnigh as fine a slaughter-house as is to be found

The same evils in modern Alexandria

anywhere in Europe. Here, however, are the same evils—slum quarters or echiches of the worst description, centres of typhus and relapsing fever (*see* Figs. 136 and 137, *page* 153; Fig. 142, *page* 158; *and* Fig. 143, *page* 159), often cheek by jowl with better-class dwellings, often close to areas inhabited by well-to-do Europeans. The conditions at the hammams, or Turkish baths, are scandalous, for at these places the town refuse, often ill-smelling and foul, is used as fuel and, being stored anyhow and everywhere, is

Conditions at Turkish baths

FIG. 139.—BACK ENTRANCE TO PUBLIC BATHS. STREET SWEEPINGS SEEN ON LEFT
CAPTAIN SIBLEY, R.A.M.C.

most offensive and dangerous (Figs. 138 and 139). It breeds flies galore; it affords a happy hunting-ground for lean donkeys, greedy goats and mangy cats. The creatures who handle it look like soot-besmirched myrmidons of Satan, and, strange to say, in the furnaces which it feeds beans are baked in earthenware jars from which they are sold in the neighbouring streets.

Until the sanitary authorities of the Expeditionary Force took stringent action most of the aerated water factories, the bakeries, pâtisseries, ice-cream shops, and the kitchens of the restaurants were sources of danger to the community, and, in certain instances,

Insanitary conditions

disgusting as well as dangerous. The markets leave much to be desired, the municipal arrangements for refuse destruction are totally inadequate, the methods of disposal of latrine-bucket contents and sewage sludge at Mex and Gabriel offensive and noxious (Fig. 141), the Infectious Diseases Hospital a disgrace to a city like Alexandria, and the Municipal Bacteriological Laboratory a place in which it is a crying shame to ask any scientist to work—at least during the hot, moist summer.

FIG. 140. REFUSE DESTRUCTOR, PORT SAID, SHOWING HERD OF PIGS ROOTING IN THE OFFENSIVE GARBAGE

CAPTAIN STIVEN, R.A.M.C.

Suez—Port Said

It is the same, more or less, in all the towns of Egypt. Here and there, as at Suez and Port Said, good work by energetic officials has remedied matters in some degree, but not so very long ago I encountered amongst the mounds of rubbish awaiting incineration at Port Said (Fig. 140) the most remarkable and nauseating odour it has ever been my ill fortune to experience, and I may say I am somewhat blasé as regards insanitary effluvia. It had a peculiar sweet flavour which defies description and demanded instant flight, so that I am still wondering what could possibly have produced it.

The Principal Infective Diseases

Now, what are the principal diseases which form the natural corollary to this state of affairs in the Egypt of to-day—the Egypt, remember, over which this country has cast her mantle of protection, which has a rightful claim upon us for assistance and advice in safeguarding the health of her people, and which, if her sanitary salvation is to be secured, must be guided wisely and well along the paths of hygiene?

Fig. 141.—Pits containing Latrine Contents, which form Fly Nurseries
Captain Sibley, R.A.M.C.

I have already spoken of the two great worm diseases; reference has been made to the frequency of other helminthic disorders; typhus and relapsing fever have been mentioned; allusion has been made to enteric fever, dysentery, plague, cholera, smallpox, pellagra, leprosy, splenomegaly, idiopathic hepatic cirrhosis, and ophthalmia. There has been some reference to venereal complaints, to deformities, and to gynæcological disorders, but we are by no means at the end of the list. Before proceeding, however, a few words may be said about one or two of those just cited. Dysentery amongst the

A lengthy list

native Egyptians, when not a symptom of rectal bilharziasis, is chiefly of the amœbic type. Whether bacillary or amœbic, it is a filth disease the cause of which, like those Dysentery of enteric, may be summarised as careless contact cases, carriers (chiefly cooks), drains, dairies, dirty drinking-water, the dust of dried dejecta, and the repulsive regurgitation, dangerous droppings and filthy feet of fæcal-feeding flies fouling food. Plague, at least

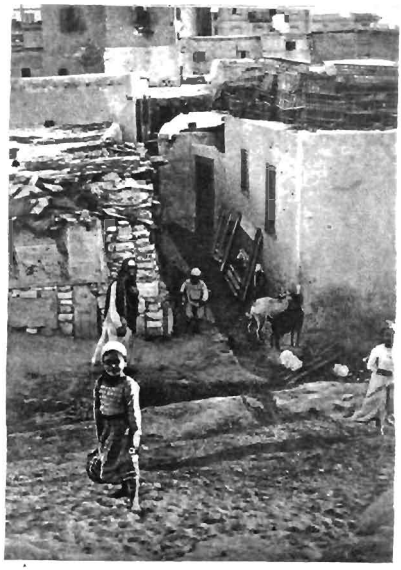


FIG. 142.—A HOTBED OF PLAGUE AND TYPHUS, ECHÈCHE CHATBY
CAPTAIN SIBLEY, R.A.M.C.

The control of cholera in its bubonic form is due to vermin, cholera in the main to polluted drinking-water, and the way in which cholera is held in check is a fine tribute to the work of the Department of Epidemic Services. Smallpox has few terrors for the vaccinated, and yet it is sad to see its ravages in Egypt. Pellagra is still a puzzle, but is possibly a combination of a

food deficiency disease and an auto-intoxication from the bowel.[1] Anyhow, it helps to fill the asylums and causes considerable misery and distress. Leprosy, another enigma, so far as its method of spread is concerned, is certainly associated with dirt and destitution, and is by no means a stranger to some parts of Egypt. Yet nothing is done for it, and the leper is free to infect the healthy. Leprosy

FIG. 143.—A HOTBED OF TYPHUS FEVER. SIDI EMAD.
CAPTAIN SIBLEY, R.A.M.C.

Splenomegaly, often accompanied by cirrhosis of the liver, may be due to various causes, all of which are not yet fully understood, but some of which are assuredly of an insanitary nature; while ophthalmia, in all its various and disfiguring forms, is too Splenomegaly

[1] The Report of the recent Egyptian Pellagra Commission indicates that the disease is due to deficiency in biological protein.

Blindness in Egypt

often directly traceable to lack of the elements of hygiene and to the ubiquitous fly. Is it not a terrible thought that at the time of the last census it was found that more than half-a-million persons in Egypt were blind in one or both eyes? All this is a sorry tale whether or not we believe man is made in God's image, but there is more to tell. Dengue fever, now definitely known to be mosquito-borne, occurs every now and then in Cairo and elsewhere. Malaria still lingers near Ismailia, and is by no means infrequent along the Suez Canal; it is prevalent and severe in the Kharga oasis, and lurks in the Delta to an extent which is only now becoming appreciated. Filariasis, another mosquito-carried disease, possesses foci in the land. An unknown fever, resembling both typhus and typhoid, but of a relapsing type, made its appearance in Cairo in 1914 and accounted for many deaths; undulant fever (a preventable malady) occurs; sand-fly fever claims its victims here and there; diphtheria is not uncommon; rabies is present to a disquieting extent; while skin infections, and more especially boils, show that the plagues of Egypt, if they once ended with the death of the first-born, have assuredly assumed a new lease of life.[1]

[1] Tuberculosis is not mentioned in the above list, but it is by no means rare in Egypt.

LECTURE II.—THE SOLUTION OF THE PROBLEM: PAST AND PRESENT

IN our last lecture we considered a number of the more obvious causes which go to make up the problem of hygiene in Egypt. There are, however, others, equally important though less apparent to the mere onlooker, which are best discussed along with the schemes that have been evolved for dealing with as difficult a proposition as a sanitarian was ever called upon to face.

THE SHARE OF THE CENTRAL GOVERNMENT

For the benefit of those not familiar with the Orient, it may be well, in the first place, to furnish some explanation of the predominant share which the Central Government has always had to play in these schemes, and which, as you will find, has been allotted to it in these lectures, so far as the perfecting of its machinery is concerned.

In England health reform is pressed upon the Government by the public; the movement originates amongst the more intelligent and more active members of the community; it is explained in the scientific journals, discussed in reviews and the public press; books are published, societies formed, lectures and public speeches delivered, deputations to Ministers arranged. By all these means the public is aroused to the necessity for action and, through Parliament, pressure is put upon the Government to introduce legislation. When at last legislation is obtained it is largely the public, through local bodies, societies, the medical profession, and public-spirited individuals, which sees to its enforcement; and it is again public opinion which demands its extension and amendment. The rôle of the Government lies chiefly in its sympathetic assistance and in helping to obtain uniformity in administration.

Health reform in England

How very different in Egypt! There the position is entirely reversed. Public opinion initiates nothing, demands nothing, enforces nothing. If, therefore, any advance is to be made in public health it is the Government which must call attention to the necessity of reform, the Government which must initiate and press through proposals, the Government which must try by education to overcome the inevitable opposition caused by the natural conservatism of the population. From the public little more can be expected than passive acquiescence in the proposals of the Government. A Central Government, therefore, strong enough on its health side to influence and arouse public opinion, to stimulate lethargic local bodies, and to demonstrate the usefulness of health measures by successful experiment, is the prime necessity of health reform in Egypt.

Lack of public opinion in Egypt

Pioneers in Sanitary Reform

The courageous person who first undertook the work of reform was Clot Bey, a Frenchman who, in 1825, under the enlightened rule of the great Mehemet Ali, established a Board of Health, which was chiefly concerned with providing means of treatment for sick and wounded civilians. This speedily led to the founding of a School of Medicine and Pharmacy and also of a Maternity Hospital, but it was not until 1845 that a Civil Sanitary Service was inaugurated in addition to the existing Military Sanitary Service, which dated back to 1820. About this time it would appear that considerable activity was displayed in abating nuisances. Vaccination was largely practised and the registration of deaths was efficient. Indeed, a European Commission reported favourably on the manner in which the sanitary department was conducted -a fact well worth remembering by those pessimists who are inclined to say Egypt was always backward and will ever remain so. It is significant that in those days, for a period of more than 12 months, no case of plague or cholera occurred in the country.

Clot Bey

Unfortunately, this satisfactory state of affairs did not continue, and, at the time when Great Britain undertook to rectify and control the administration of the country, sanitary matters were in a lamentable condition. The causes are not far to seek, and, as some of them are operative in the problem of to-day, they may be briefly noted.

The lethargy of the East played an important part; corruption, with the inevitable cry for backsheesh, was rampant; ignorance, indifference and lack of recognition of all that a sound and energetic sanitary policy stands for exerted a baleful influence. In addition, the finances of Egypt were in a most parlous condition, and there was actually very little money available for health measures. In those days, also, fanaticism was more powerful than is now the case, and it was difficult to remedy the state of the mosques, which was often deplorable and afforded every facility for the spread of disease.

Causes of regression

The Department of Public Health

In 1883, Mr. Clifford Lloyd created a Department of Public Health, and its first director was one who, in later days, delivered the Chadwick Lectures with much acceptance, Dr. F. M. Sandwith, a man who ever placed duty before self and who, as Lord Milner says, "was got rid of by a rather ignoble intrigue due to the excessive zeal which he had shown in the dismissal of corrupt subordinates." Sandwith, however, set the sanitary ball rolling, and, though its pace slackened, a fresh impetus was imparted to it when Rogers Pasha, now Sir John Rogers, assumed control. He did a great deal for sanitation in Egypt, and his successor, Sir Horace Pinching, carried on the good work. It is unnecessary to enter into particulars as regards the various schemes put forward and completed during the period when these two able administrators fought disease and death in Egypt. Our theme is the problem at the present time, for, despite all they accomplished, they were very far from attaining anything like perfection, and those who followed them found plenty to do and left plenty to be done. At the same time, it is necessary to note that the cause of hygiene was helped indirectly, but very effectually, by the manifold reforms carried through in other departments of the Government service. The fact that Egypt

Dr. Sandwith

Sir John Rogers

Sir Horace Pinching

was rescued from bankruptcy and became financially prosperous aided sanitation, the spread of education helped it in large measure, the great development of public works, and especially of road-making, water-supply and drainage schemes, assisted enormously; in other words, sanitation shared in the benefits attending the general quickening, as must ever be the case. It is essential that the hygienist should possess a spirit of sweet reasonableness and recognise that money expended on other services than his own may often be regarded as chinking in the sanitary coffers, though I admit it is not always easy to cultivate so philosophic a spirit, and that too much complacency in this direction is strongly to be deprecated.

Short comings of the administrative scheme

Bearing all these points in mind, and remembering that lethargy, corruption, ignorance, indifference and intrigue are always likely to hinder sanitary progress in Egypt, as indeed they do in other countries, let us see in what directions the lately existing scheme of health administration—a scheme, be it noted, admirable in many respects and the outcome of years of experience and labour—fell short of the ideal, and thereby contributed its quota to the causes which we are considering.

In order to do so it is necessary to discuss the scheme itself, and I direct your attention to the graph (No. 1, *page* 164). As I have indicated, this scheme, or rather its execution, has gone a long way towards solving health problems in Egypt, and in its discussion attention will be drawn not only to its shortcomings, such as they are, but to its virtues, while points which may be obscure to those unfamiliar with the land of the Pharaohs will be elucidated so far as this is possible in the time at our disposal.

It will be seen that the Department of Public Health is merely a section of the Ministry of the Interior. It does not, so to speak, stand on its own legs. In "Modern Egypt" Lord CROMER devotes a chapter to the Interior and a subsidiary chapter to its three sub-departments. These are: (1) prisons; (2) slavery; (3) medical and sanitary administration. There, in a nutshell, you have one of the chief causes of the problem of hygiene in Egypt—lack of adequate and fitting status for the organisation that controls the factors governing the health of the nation.

Sub-ordinate position of sanitary administration

One need not feel surprised that so notable an administrator as the late Lord CROMER was content with such a situation, was satisfied, or apparently satisfied, to class a great sanitary administration along with the sections of Government which look after prisoners and slaves. Lord CROMER belonged to a school which was not greatly concerned with health problems, save when waves of epidemic disease disturbed their peace of mind and the well-being of the community. Though by no means indifferent to medicine and hygiene, and a good friend to the scientist, he perhaps scarcely realised the full significance of sanitary work in such a country as Egypt. I am quite certain he was infinitely more interested in Greek verse than in the pathogenic protozoa. Small blame to him. The day he represented is only now passing, and it is passing slowly and with some reluctance. The medical profession itself is largely the cause of a conservatism which has hindered progress in hygiene, which has obscured the truth enshrined in EMERSON'S famous dictum: "The first wealth is health." The Faculty from time immemorial has been much more interested in the cure than in the prevention of disease, though, to its honour be it said, medicine is the profession above all others which cuts its own throat, which has always endeavoured to efface itself by following an unselfish tradition. But it is not only the

PRESENT ORGANIZATION OF

THE DEPARTMENT OF PUBLIC HEALTH

CENTRAL ADMINISTRATION

GRAPH No. 1

MINISTER OF THE INTERIOR

UNDER-SECRETARY OF STATE

DIRECTOR-GENERAL

ASSISTANT DIRECTOR-GENERAL

Director, Section I.
Registration of births and deaths (acts as Registrar-General)
Vital Statistics.
Etablissements Insalubres.
Cemeteries —
Establishment of new
Delimitation of old.
Disinfection of old.
Exhumation and transport of bodies.
Private tombs.
Dépotoirs for street refuse and sewage
Sanitation of Government Buildings.
Sanitation of Schools and *Kuttabs*.
Fencing of waste land
Water supplies
Birkas.
Medico-legal work
Prostitution.
Drainage —
Public latrines.
Drainage connections, etc.
Sewage
Sanitation of Mosques.

Director, Section II.
General Hospitals.
Dispensaries.
Isolation Hospitals.
Hospital statistics.
Inspectorate
Dispensaries.
Children's Dispensaries.
Maternity Schools.

Director, Section III.
Ophthalmic Hospitals, permanent and travelling.
Ophthalmic inspection of Schools.

Director, Section IV.
Epidemics.
Disinfection.
Vaccination.
Pilgrims.
Passenger control.
Malaria.
Malaria.
Barbers.
Control of Medical Services of the Frontier Districts Administrations.
Infectious diseases, statistics.

Director, Administration of Markazes

Director, Accounts

Director, Public Health Laboratories
Bacteriological
Chemical
Sewage Disposal
Sanitary Institutes
Water analysis

Director, Inspectors

Director, Engineers

Director, Epidemics

Director, Sanitary Engineer, Water analysis

PROVINCIAL ORGANIZATION

English Divisional Inspectors who inspect all sanitary and General Hospitals work in the Provinces and report to the Director-General.

Inspectors of Ophthalmic Hospitals

Hospital Medical Officers and *Hakimas*

Hospital Medical Officers

Medical Officers of Health for Cairo and Port Said, or Health Inspectors Ouzir and Diamettat of Governorates

Cairo Medical Officers in Cairo.

Barbers and *Dayas* in Villages attached to Governorates.

Markaz Health Inspectors.

Special Epidemic Staff, disinfectors and labourers.

Markaz and District Medical Officers.

Barbers and *Dayas* in Villages
Burial permits.
Vaccinations.
Inspection of Deaths.

*Registration of births and deaths is done by Omdas and Sheikhs.

WORK OF MARKAZ DOCTOR

1. Infectious diseases.
2. Medico-legal examinations and reports.
3. General Sanitation
(a) Barbers
(b) Inspection of Schools and *Kuttabs*
(c) Mosques, water system, inspection
(d) Inspector's reports on Government Buildings
(e) Results for registration of water supplies
(f) Cesspool cleaning
(g) Manufacturing cases
(h) Enclosure of waste lands
(i) Inspection of dispensaries, plans for town refuse and house connexion
4. Epidemic control (inspection)
5. Control of registration of births and deaths
6. Vaccination
7. Dispensaries
8. Medico-legal examinations where no hospital exists
9. Cemeteries —
Care and upkeep
Disinfection of old
Exhumation of bodies
Private tombs.
10. Public Health Inspector on Local Committees
11. Contraventions against the law regarding vaccination and care of children
12. Pilgrims
13. Passenger control
14. Malaria
15. Examinations and reports on sick Government employees
16. Examination of infants
17. Inspection of deaths and burials

N.B. An additional copy of this Graph will be found in the wallet at the end of the book

clinician who, by indifference and lack of interest, has put his spoke in the sanitary wheel. The hygienist himself has too often been to blame, for how often has he asked for impossible things in an impossible way! His outlook has frequently been narrow, and it is no wonder that men like CROMER, who were accustomed to take a wide survey of life and of affairs, who had to weigh the claims of many applicants for money, and who, in addition, could scarcely be expected to appreciate fully how the increase of scientific knowledge had placed new and effective weapons in the hands of the sanitarian—it is not surprising, I say, that such men were a little apt to be suspicious of the enthusiastic reformer whose constant cry was that if he only got the funds he would achieve hygienic miracles.

The difficulties of the administrator in this respect are well set forth in the concluding chapter of that very interesting book by Dr. MALCOLM WATSON, "Rural Sanitation in the Tropics." Therein he quotes the very words of the famous Egyptian Pro-Consul to good effect. It is, however, at last being understood that the welfare of a nation is closely bound up with the health of its people. Nowhere is this more true than in Egypt, and nowhere is there a greater necessity for establishing a Ministry of Health. In this connection let me read you a portion of a valuable memorandum on the subject by Dr. CYRIL GOODMAN, late Assistant Director-General of the Egyptian Public Health Department, and one, truth to tell, who is much better qualified to deliver these lectures than I am, for he knows Egypt intimately and has done much to guide her health policy along sound and practical lines. He says :— Dr Goodman

> "As there is no public opinion in the country demanding health reform, the whole of the driving force in favour of health measures must come from within the Government itself, or rather that part of the administration charged with public health duties. The progress attained is directly proportional to the influence which can be brought to bear upon the Government.
>
> "As at present constituted the Department of Public Health has no direct influence upon the policy of the Government; it is represented neither upon the Council of Ministers nor upon the unofficial Council of British Advisers which, with the High Commissioner, go to make up the somewhat informal system of government in Egypt. The High Commissioner, except in so far as he is controlled by the Foreign Office, is possessed of supreme authority in so far as he cares to exercise it, but the representative of the Public Health Department has no right of access to him to press forward public health measures or to oppose measures detrimental to the health of the country. Lack of status of Public Health Department
>
> "The Public Health is a subordinate Department classed with and often below the Customs, the Coastguards, the Public Lands and the Survey Departments, which, however important in themselves, have very little concern with the public policy of the country. The result of this system, or lack of system, is, as might be expected, a reign of disorganisation and misunderstanding. No opportunity is ever offered for the consideration of the health problem as a whole; lack of co-ordination between the various departments has led to conditions injurious to health which might have been easily remedied at the outset; individual public health measures are presented and pressed forward second- and very often third- or fourth-hand, or not presented at all—killed or mutilated for some unknown reason by some unknown official of the superior hierarchy; measures with a strong public health bearing are discussed and agreed to without consultation of the department, which is left with the choice between silence and a belated and irritating protest. In short, the position of the department is very much that of an indignant subscriber whose only resource, if he disagrees with the policy of his paper, is to write a letter of protest which his editor may or may not insert."

This is a serious indictment of the Government machinery, but I believe it to be fully justified, and I should say that this cardinal fault of lack of status is the chief of those more obscure causes which to-day render the question of health in Egypt as paradoxical as is the country itself.

The burden of petty detail

In the past the Director-General has been burdened with petty details, a state of things which has tended to prevent him devoting sufficient attention to larger questions of policy and to the bearing of scientific discovery and progress on the affairs of his department. No separate section of medical intelligence has been available, and though, as will be seen, the Director of the Public Health Laboratories has ably filled the post of technical adviser in addition to his other duties, it is essential in these days of rapid change and widespread activities to have a properly organised bureau of information attached to every large department of hygiene. Egypt has suffered from the want of such an institution, and there has also been an absence of means for enlightening both Government officials and the public generally as to the nature and prevalence of preventable disease and the measures which have been and should be taken to combat it.

Need of Intelligence Section

Grouping of Sanitary Administration

Turning again to the graph and the Central Administration, we see that there are four chief sections of work, each controlled by a director. These are the sections dealing respectively with general sanitation, with hospitals, with ophthalmic hospitals, and with epidemics. It is necessary to consider them briefly in detail.

1. *Section of General Sanitation*

General sanitation

Probably nobody but the director of Section I has any real conception of the multifarious duties which fall to his share and the difficulties with which he is constantly beset. These difficulties, though largely due to the presence of the Capitulations, the state of sanitary law in Egypt, and in some instances to the flatness of the land, its water-logged condition and the comparative scarcity of fuel, are also caused by an overloading of the section with matters which should be dealt with elsewhere. As a result, the ill-effects arising from a chronic paucity of staff are intensified. For example, a great deal of the work concerned with cemeteries, is, strictly speaking, not sanitary work at all, and should be relegated to the State Domains Administration or, at the present time, to the Survey Department. Later on, when local self-government has become a power in the land, as must needs be the case, the municipalities and village councils will doubtless assume control of the cemeteries in their respective districts. Anyone versed in public health administration will wonder why the words "medico-legal work" appear on the list of subjects classed under general sanitation, and no one not conversant with Egypt could read the riddle. It is no use saying more about the matter here, for the question is intimately bound up with the duties of the Markaz doctor, and will be considered when we discuss the rôle which that indispensable person plays in the provincial organisation.

Prostitution figures in the list, possibly with more reason, for at last, at long last, the nations are beginning to understand all that the results of prostitution cost them in the way of expense, inefficiency, wrecked homes, disease, degradation and death. Still, prostitution is so intimately bound up with venereal clinics and hospital treatment that its sanitary control is undoubtedly better exercised elsewhere than in the company of offensive trades, insanitary buildings, drains, water-supplies, conservancy arrangements and all the various matters which are sometimes, for the sake of convenience, and not too inaptly, classed as nuisances. A possible objection to the use of this term may, however, be found in the fact that the harassed director of this section would often gladly extend it to include officials of the Ministries of Finance and Justice, who, possibly through no fault of their own, are brought sharply into conflict with him. Evils of prostitution

It is undoubtedly along the lines mentioned in this section that there has been the least progress in the past, and it is probable that general sanitation presents the most difficult of all the problems which have to be solved. The hygiene of the village, of the native quarters in the cities and large towns, the destruction of flies and mosquitoes, the control of food, the sanitary regulation of buildings, are all included in this part of the health campaign, and, as has been hinted before, it is no easy matter to hustle the East.

II. *Section of General Hospitals*

Hospitals, except those for infectious diseases, do not usually come under a public health administration, but you will see that Section II embraces general hospitals, dispensaries and maternity schools. The department whose work we are considering *would probably in other countries than* Egypt be *termed* the *Department of Medical* Services, for it is concerned with all matters affecting health. It is, I think, to the credit of those who christened it that they gave it a comprehensive title and one which brings prominently into notice the hygienic side of the work. It is not, however, the best name. That, let us hope, will soon be applied and will entail a radical change, converting the department into a ministry—a Ministry of Health.

Most of the general hospitals under the Public Health Department are satisfactory, but there are *not enough of them.* This is specially true *in the case of* the larger provincial towns. The hospital is no longer looked upon with dread and suspicion. Not so long ago most of the lower class Egyptians certainly believed that a suitable hospital motto was: "All hope abandon ye who enter here," but happily that day is past and now the cry is for more beds and yet more beds. Hospitals, however, cost money, and there's the rub! The Central Treasury has not a chest of bullion like the widow's cruse, and yet money must be found. Here then, is another problem, the only solution of which lies in the establishment of *local self-government* and local taxation; *measures still* in their infancy in Egypt but capable of great development. Paucity of hospitals

When this occurs it will be possible to provide more permanent hospitals for *infectious* disease. These are badly needed, for whatever the future may have in store, it will be long before communicable disorders cease to be one of the plagues of Egypt, and though Infectious diseases hospitals

certain of them are, perhaps, best treated in emergency hospitals, others require the comfort and hygienic surroundings associated with a permanent building. Both classes of hospital suffer to some extent from a lack of sufficiently frequent and skilled inspection.

Dispensaries

Dispensaries, and more particularly children's dispensaries, are amongst the most useful health institutions in Egypt, but there are far too few of them, especially considering that the provision for children's beds in the general hospitals is inadequate. There is also a lack of beds for gynæcological cases, and a great need for women's out-patient clinics throughout the country. You will see that maternity schools figure in the list. There are six of these, but that number is not sufficient. Owing to the harem system in Egypt, the proportion of maternity cases attended solely by midwives is very high, amounting almost certainly to over 90 per cent., and at present the training of the dâyas or midwives is most defective, while the mumarridas, though well trained in nursing and midwifery at the Kasr-el-'Aini Hospital in Cairo, have, partly as the result of having long been called hakimas, been in the habit of practising medicine as well as midwifery, and certainly require to have their duties defined and their activities controlled. There is good reason to believe that they often pass from a case of infectious disease to a childbirth without taking any precautions whatsoever. The result of such a state of things can readily be imagined.

Maternity schools

Midwives and nurses

One cannot leave the question of children's dispensaries and maternity schools without paying a tribute of admiration to the excellent work performed by the inspectress of the Public Health Department in connection with these institutions. Taking this hospital section as a whole, it may be said that, while a great deal has been accomplished, it yet furnishes a good many of the causes which help to make the health problem so pressing and so difficult to solve. There are errors of omission, there are errors of commission, and, at a later date, we will consider how these may perhaps be rectified or, at least in some measure, minimised.

III. *Section of Ophthalmic Hospitals*

Turning to Section III, we find we are again concerned with hospitals, but with hospitals of a special class. We are at once in touch with a great and beneficent charity, excellently organised, admirably conducted, which has brought relief and cure to thousands, which many have good reason to bless, and which no Britisher can study without a feeling of pride and satisfaction. If the British occupation of Egypt had resulted in nothing beyond the establishment of the ophthalmic hospital system, it might still have been claimed for it that it had conferred a great boon upon the inhabitants.

This campaign, however, owed its inception to private philanthropy, for at first the expenses were defrayed out of a fund provided by Sir ERNEST CASSEL. This was in 1903, and prior to that date practically nothing was done for eye diseases in Egypt, although no less than 4½ per cent. of the total population was blind in one or both eyes. At first there was only one travelling hospital, but the zeal, energy and skill of the director soon led to a much larger organisation, and at the present time there are 13 permanent eye hospitals and five travelling hospitals (*see* Fig. 144, *page* 169 and Fig. 145, *page* 170),

Permanent and travelling hospitals

with a staff of 29 doctors, carrying on a most beneficent prophylactic and curative work. These hospitals also serve as training centres in ophthalmic surgery, and many medical men have passed through the post-graduate courses held in them. A visit either to a permanent or temporary ophthalmic hospital is, as I can testify, full of interest. Women and children form the greater number of the patients who suffer from trachoma, trichiasis, corneal opacities, cataracts, and indeed every form of eye affection. Let us hope that

Patients

FIG. 144.—SOHAG OPHTHALMIC HOSPITAL

those who have still their sight or whose vision—praise be to Allah!—is restored, benefit from what they see of the cleanliness, smartness and order of these model hospitals. The people flock to them, 81,000 patients being now treated in them annually, and—best sign of all, for imitation is the sincerest flattery—various provincial councils have established ophthalmic hospitals of their own, while the medical service of the Ministry of Waqfs, a Ministry which controls large funds from Moslem sources ear-marked for charitable purposes,

Imitation the sincerest flattery

possesses a special Eye Hospital at Kalaoun in Cairo. As the sectional director reports: "The provision of means of ophthalmic relief is one of the few things besides education in which the Egyptian has taken a keen interest, and it is frequently stated in native circles that the provision of ophthalmic hospitals reflects more credit on an individual or group of individuals than the building of a mosque." All this is very gratifying, but there is still need of expansion. The provinces of Qena, Assuan and Qalioubia have been left out in the cold, and there the poorer classes suffer and have, so far, little chance of

FIG. 185. TENTED MOBILE OPHTHALMIC HOSPITAL

remedy. But the section is not only concerned with hospital work. Its activities have extended to the Government primary schools, for it has been recognised how important it is to obtain trachoma cases at an early stage and cure them before irremediable damage has been done. Actually 90 per cent. of the pupils show signs of the disease either in an active or passive form. The pressing question now is to apply the same methods of inspection and treatment to the kuttabs, or infant schools. It will cost £E.40,000 per annum to do so, but it is well worth the money, which should be obtainable from local sources.

Prevalence of trachoma

Yet another duty devolved on the ophthalmic section when, at the instance of the late Lord Kitchener, it undertook a campaign against ankylostomiasis, not very long before the outbreak of war. As the Egyptian Government did contribute something towards the expenses of this campaign the Britisher may perhaps view it with feelings less mingled than those with which he regards other campaigns against the hookworm in various British Colonies and Protectorates, or, indeed, that waged under the auspices of the Church Missionary Society in Egypt itself. In this case, as elsewhere throughout the world, Great Britain has been in large measure content to allow its American cousins, or as one now might almost say, brethren—brothers-in-arms at least—to assume its responsibilities and to do work which, rightly speaking, it should have done.

Campaign against ankylostomiasis

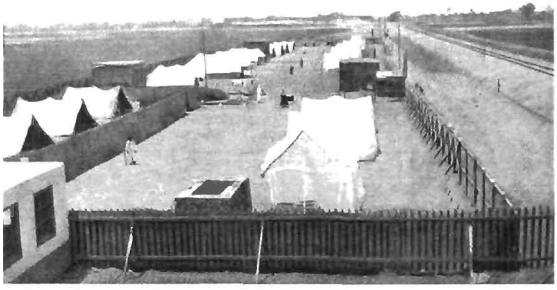


FIG. 146. LARGE TRAVELLING UNCINARIASIS HOSPITAL, QALIUB, EGYPT
ROCKEFELLER COMMISSION REPORT

Whatever may be our views as regards the utility of the methods employed (and I may say that not a few believe that it would be better to concentrate attention on ankylostome breeding-places and not on the victims of the disease)—whatever our views, all honour must be ascribed to the Rockefeller Institute for what it has achieved, not only in the States and in countries under the Stars and Stripes, but in British Colonies and Protectorates (Fig. 146; *also* Fig. 147, *page* 172). We owe it a debt of gratitude, but surely it is strange that the British Empire, which is not lacking in millionaires and which stands *in loco parentis* to hundreds of thousands of sufferers from the hookworm, should complacently accept this gift of money and of workers from

Importance of breeding-places

American work

America, and do little more than afford facilities for treatment and research. I confess it has always seemed to me an attitude unworthy of a world-wide Empire which, thanks to Sir PATRICK MANSON and the presence of our far-flung possessions, was the pioneer nation in the study and treatment of tropical diseases. Let us hope that once we all settle down this reproach will be removed, and that we will take up such part of the white man's medical burden as rightly falls to our share.

FIG. 147.—PATIENTS TAKING THYMOL. EGYPT

IV. *Section of Epidemic Diseases*

Typhus and relapsing fever

We have already paid a well-merited tribute to the efficiency of Section IV., which controls epidemic disease, and from the list you will see the various branches of the work with which it is concerned. Outbreaks of typhus and relapsing fever are seasonal in Egypt, and during the epidemic season you will find scattered about the country the temporary hospitals or cordons run by this section. They are simple structures, but are well designed to cope with emergencies, and they combine efficiency with economy. There

Plague

can be no higher praise. Similar hospitals deal with plague patients, while this section has a special epidemic staff in the provinces, where it also possesses disinfectors and rat-catchers.

Vaccination, a most important duty, falls to its share, and it is ever bustling and busy, as indeed it must be, for the motto, when dealing with epidemic disease, especially in a country like Egypt, must ever be, "Strike early, strike quickly, and strike hard!"

You will notice that pilgrims and passenger control figure in the list, and let me say at once that this has nothing to do with international quarantine. The control is exercised over all passengers arriving from cholera-infected countries once they are safely ashore. It supplements the work of the International Quarantine Board, of which it is convenient to speak here, though very briefly. It will be remembered that, in our first lecture, we began by considering the part which Egypt plays as a filter for communicable disease. This filtering action has in the past been conducted, and very well conducted, under the ægis of a somewhat heterogeneous body, over which presided for many years a man of brilliant parts, with the pentecostal gift, with many of the qualities of genius and an abundance of tact and discretion, a man whom, alas! the sea which he loved so well and with which he had so many dealings claimed for its victim, as it has claimed so many in the late war. I refer to Sir ARMAND RUFFER, under whose guidance the Board guarded Egypt faithfully and well. His monument is El Tor, the great quarantine station which he established in the Sinai Peninsula, and where he encouraged and promoted research work upon cholera, plague and dysentery. In addition, the Board carried out much port work at Abu Saad near Jeddah, at Suez, at Port Said, and at Alexandria. It may be said that it did not control the Hedjaz railway, which had its land lazaret at Tebuk, nor did it look after Indian pilgrims, for whom the Indian Government provided a quarantine station at Camaran, a station wiped out by the Turks.

Quarantine

Sir Armand Ruffer

As it acted under the terms of the Paris Convention, the Board could only apply quarantine against cholera-infected ports and not countries, and yet a port might be free and part of the country to which it belonged infected. Hence the Epidemic Section could furnish most useful help by inspecting and registering passengers on arrival from cholera-infected countries. Pilgrims also returning after quarantine at El Tor were dealt with, and medical officers of the places to which they were returning were notified, so that surveillance could be instituted and, if necessary, specimens taken for bacteriological examination.

Mûlids are fairs, and great nuisances as centres of infection. The other items do not call for special notice here. We will meet with the barbers in due course, while the Frontier District Control has to do with new conditions arising out of the war.

On the whole, it may be said that this section rather solves than creates problems. It saves lives and it saves money—many lives and much money—and few English folk in Egypt outside the Public Health Department know much about it or its work. The village Omdahs and Sheikhs, however, know all about it and, I believe, usually appreciate these mushroom hospitals of wood and matting.

Other Services: Public Health Laboratories

Public Health Laboratories

So much for the four sections. Of the other services, which you observe also form part of the Central Administration, I propose to consider only two—the Public Health Laboratories and the Inspectorate of Pharmacies.

The laboratories, which are under a most capable director, and which have rendered great service to the cause of health in Egypt, were started in 1896 by Sir John Rogers, and from modest beginnings have attained respectable proportions. There is, however, a very pressing need for an extension in the accommodation provided, especially as regards the chemical and bacteriological laboratories (Figs. 148 and 149 ; *also* Fig. 152, *page* 177).

Fig. 148.—Central Laboratories, Public Health Department, Cairo
Dr. C. Todd, O.B.E.

At present there is no protozoologist, and yet the pathogenic protozoa play no unimportant part in Egyptian pathology, as witness *Entamœba histolytica* and *Leishmania tropica*, the causes respectively of amœbic dysentery and oriental sore.

Anti-rabic Institute

You will note that smallpox vaccine is manufactured at an institute attached to the laboratories, while there is also an Anti-rabic Institute—a very necessary establishment in a land where rabies is common and where the bites received from rabid dogs, wolves and jackals are often facial and severe. It is a very interesting place, this institute, with its crowd of patients, mostly blue- or black-garbed fellaheen or ragged slum-dwellers, but

with a sprinkling of all classes of the community (*see* Fig. 150, *page* 176; *also* Fig. 151, *page* 177). The dexterity with which the inoculations are given is remarkable, and many patients must yearly be saved from the horrors of hydrophobia.

Vaccine Institute

The Vaccine Institute, though small and somewhat archaic in the matter of special apparatus, is well run and fulfils a very useful function. Buffalo calves furnish the supply of lymph which, from the results obtained, evidently possesses good immunising powers. In a country like Egypt, where smallpox is rife, such an institution is essential, and it should be kept up-to-date in every particular.

FIG. 149.—GENERAL BACTERIOLOGICAL LABORATORY, CENTRAL LABORATORIES, PUBLIC HEALTH DEPARTMENT, CAIRO
DR. C. TODD, O.B.E.

Allowing for the value of the vaccine lymph produced, deducting the fees paid for treatment at the Anti-rabic Institute and those received for analyses, the annual upkeep of these excellent laboratories only amounts to about £E.5000. As their director has modestly stated :—

Cost of Laboratories

"For this sum the Government obtains a reasonably efficient bacteriological and chemical service, including the following regular services: 1. Bacteriological diagnosis for the whole of Egypt except Alexandria. 2. The diagnosis work of the city of Cairo. 3. A regular bacteriological and chemical control of the Cairo water supplies. 4. The analytical work of the Inspectorate of Pharmacies. 5. All bacteriological and chemical examinations required for the General Sanitation, Epidemic and Hospital Sections of the Department and for the Cairo Inspectorate, the work for the latter including a regular milk control and a bacteriological control of the Cairo aerated water and ice supplies."

Here, indeed, is a worthy record of work, and, in addition, research is conducted as opportunity offers, while the director acts as scientific adviser to the department which he serves.

Water Control Services

The Water Control Service, which comes under the laboratories, is yet in its infancy, but it is an important development, for if water plays a paramount part in the well-being of Egypt, it is one of the chief sources of trouble from a hygienic and economic standpoint, and water-supplies everywhere require to be regularly inspected and adequately controlled. Moreover, a careful study is required of the manifold problems connected with drinking-water in Egypt.

FIG. 150.—ANTI-RABIC INSTITUTE—GENERAL VIEW. CENTRAL LABORATORIES PUBLIC HEALTH DEPARTMENT, CAIRO
DR. C. TODD, O.B.E.

Inspectorate of pharmacies

It is, perhaps, a little surprising to see an inspectorate of pharmacies figuring as an important branch of public health administration, but pharmacies play quite a peculiar part in Egyptian life, and many of them require close supervision. Some day someone may write a romance of Egypt with pharmacies well in the foreground. It is doubtful if permission could be obtained for the publication of such a work, but if it ever saw the light of day what tales would be forthcoming about the smuggling of forbidden drugs, about opium and cocaine, about the sale of aphrodisiacs, abortifacients, and patent medicines, about the trade in spices and perfumes, about poisons, and especially those grown in Egypt, such as hyoscyamus and datura! All kinds of abuses exist, for pharmacists, ignorant of medicine, usurp the duties of the medical man, and drugs are adulterated or tampered with, to the detriment of purchasers. The Inspector of Pharmacies has his own problems to face, and he will be greatly helped when the Capitulations are abolished, when new legislation is introduced, when private laboratories are better controlled, when facilities for the inspection of pharmacies are increased, and when an official pharmacopœia is duly recognised in Egypt.

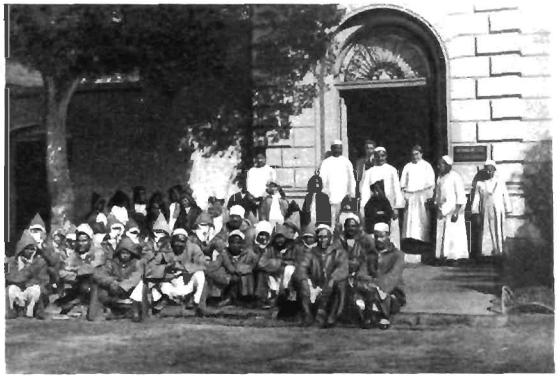


FIG. 151.—ANTI-RABIC INSTITUTE: PATIENTS ARRIVING FOR TREATMENT
CENTRAL LABORATORIES, PUBLIC HEALTH DEPARTMENT, CAIRO
DR. C. TODD, O.B.E.

FIG. 152.—CHEMICAL LABORATORY, CENTRAL LABORATORIES
PUBLIC HEALTH DEPARTMENT, CAIRO
DR. C. TODD, O.B.E.

SEVERANCE OF CERTAIN ORGANISATIONS

The graph (No. 1) would seem to indicate that our proper course would now be to discuss the provincial organisation, but before doing so it is necessary to point out that of late years the Public Health Department has suffered some loss in efficiency through a tendency towards the severance of certain of its services from the Central Administration. In addition, some Government medical services in Egypt have never been within the fold. As examples of these statements, I may cite the medical services of the railways, police, prisons and coastguards, and what is known as the Central Medical Commission, which is concerned with the medical examination of candidates for Government posts.

Tendency towards distruction

As the special Public Health Commission reported last July:—

> "A department like that of Public Health may be likened to one of the Great Powers with many possessions. So long as the central grip is firm and the responsibilities fully recognised the component parts will remain united, but the first sign of decadence and weakness is often a tendency towards disruption."

The proposals submitted for checking this tendency and remedying the existence of this state of affairs will be dealt with in due course. Meanwhile, it seems advisable to say a few words about the municipalities and local commissions which, with the provincial councils to which passing reference has been made and which are like county councils in England, form the hope of local self-government and town development in Egypt. On this account it is upon them also that the responsibility of grappling with many sanitary problems will assuredly fall.

Time will not permit a historical survey of the foundation and progress of the municipalities and local commissions; they come under the Ministry of the Interior, but are quite distinct and separate from the Public Health Department. Yet they are largely concerned with sanitary engineering and with public works which have a distinct bearing on the health of the people—such works, for instance, as the care and maintenance of roads and cemeteries, water supply, scavenging, and the superintendence of slaughter-houses. They are also concerned with lighting, and let it always be remembered that a dark town is a dirty town in more ways than one. The municipalities exercise their functions in some of the larger provincial towns, the local commissions in 35 of the smaller towns of Egypt. They are in some ways analogous to municipal councils and town councils in this country, and are administered in an able manner by a British director who happens, fortunately, to be a medical man. Already they have accomplished much good work, some of which we shall look at in a moment; and, considering the ever-increasing burden of expense in public health matters—a load which no Central Treasury can possibly shoulder—it is clear that the municipalities and local commissions must remain apart and form the nucleus of a future scheme whereby the municipalities will manage their own health affairs under the guidance and advice of the Ministry of Health.

Functions of municipalities

LECTURE III. THE SOLUTION OF THE PROBLEM: PRESENT AND FUTURE.

IN our first lecture we considered the more obvious causes which produce the problem of hygiene in Egypt; in our second we discussed those which are more obscure and which, being intimately bound up with the form of central administration that is in vogue, led to a review of the latter. We will now turn our attention to the provincial organisation and see not only what problems it furnishes but how it meets the needs of health in the towns, in the villages, and in the rural parts of the Mudiriyas, as the provinces are termed in the Arabic of Egypt.

EXISTING PROVINCIAL ORGANISATION

The Provinces

It is usually a relief to leave a city like Cairo or Alexandria and fare forth into the green of the Delta. The air is fresh, the sky is, as a rule, blue and cloudless, and though the scenery is monotonous the rural life is interesting, and there are many spots which are eminently picturesque. In Upper Egypt one is not often far from the Nile, and the Father of Waters rarely fails to please the eye and quicken the imagination.

Rural Egypt

If there is not very much to entrance the botanist and the zoologist, at least compared with some other eastern lands, there is always something in Egypt to catch the sanitary eye and too often something also to titillate the sanitary nose. The sanitarian views a reedy water channel, and while he thinks of it turning the black alluvial soil into the richest of muds and benefiting the patient cultivator, he knows that as a source of drinking-water it is, to say the least, doubtful: for may it not in parts be full of cercariæ or constitute a medium wherein typhoid or dysentery bacilli lurk; or, given the opportunity, may it not harbour the cholera vibrio? He notes the rich mud and the fellaheen ankle-deep at work in it, and wonders whether or not the larvæ of ankylostomes are busy finding their way through the skin of the peasant farmers. A grove of stately date palms confronts him, and, while he admires them for their beauty and their fruitfulness, he cannot forget the filthy manner in which *'Agwa* is prepared (*see* Figs. 153, 154, 155 and 156, *pages* 180, 181, 182 *and* 183). His eye roves over the picturesque nondescript village huddling on its little mound hard by the birka with its green scum and countless frogs, and though he admits it has a beauty of its own, he cannot but recall its flies and their breeding-places, its rats and their fleas, its inhabitants and their lice, and instinctively he thinks of dysentery, of plague, of typhus and relapsing fever.

Its lessons

And so on and so forth. You will doubtless say what a very unpleasant mind your sanitarian must have! It is one thing to find sermons in stones and books in the running brooks, but surely to conjure up parasites and disease in wellnigh every feature of the landscape is a dismal form of mental recreation, a morbid type of fancy. I grant you such is in some measure the case, but the pity is that there is good cause for these

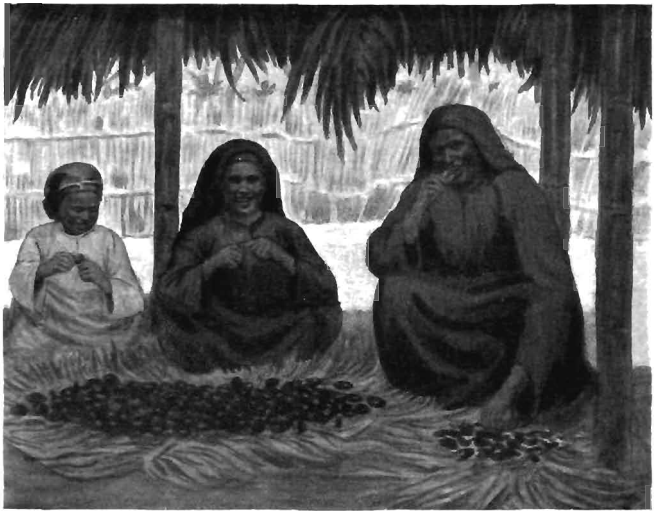


FIG. 153.—PRELIMINARY STEPS IN THE PREPARATION OF DATES
REMOVING THE DATE STONES

imaginings. And yet the sanitarian is, as a rule, no pessimist. He knows these evils exist, but he also knows that they are one and all preventable, and his ambition is to remedy them so far as it lies within his power to do so. Their presence arouses, or should arouse, the fighting-spirit in him, and, believe me, there is something stimulating and satisfying, as well as disheartening, in waging war against the forces of disease and death in such a country as Egypt.

The stimulus

That is one reason why we are always likely to find able young men eager to take up the work of divisional inspectors who, as you will see from the graph (No. 1, *page* 164, Lecture II), head the list of those who fight the battle of health in the Egyptian provinces. Divisional Inspectors

One reason why the contest has not been so victorious as might have been hoped is to be found in the paucity of the numbers of these Divisional Inspectors. There are

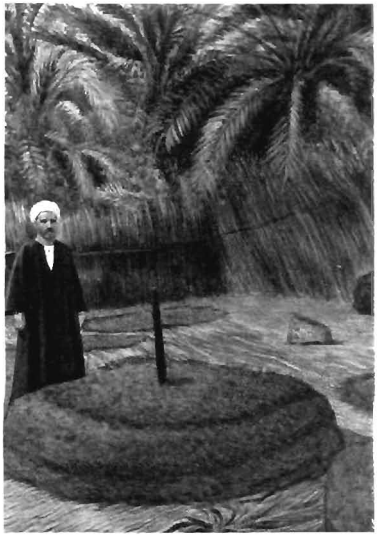


FIG. 154.—HEAD OF *Amûn 'Aqwa* READY FOR PACKING
After T. W. Brown

14 provinces in Egypt, many of them large, most of them exceedingly populous. The number of Inspectors has in the past been woefully few, and during the war it diminished almost to vanishing point. Furthermore, the Inspectors were not resident in their districts. As a rule, they were constantly on the move, and so were not in the best position for getting into close touch with the populace and the prevailing conditions. Paucity of Inspectors

Their duties

Their duties also were far from being merely sanitary, as they had to exercise a supervision over the provincial hospitals, the medico-legal work of the Markaz doctors, and all the hundred and one matters which are intimately bound up with health problems in the provinces.

A glance at Graph 1 shows that the provincial work is divided into that concerned with hospitals and that which is directly under the charge of the Markaz and outpos

Fig. 155.—Weighing *Amhat 'Agwa* before Packing
After T. W. Brown

Mudiriya Health Inspectors

doctors, and which is a regular *olla podrida* of widely-differing duties. The question o provincial hospitals need not detain us. In discussing Section II of the Centra Administration we saw the problems they present. It is time to turn to the Mudiriya Health Inspectors, who are, for the most part, stout, worthy and elderly Egyptians who form the link between the English divisional inspectors and the Markaz doctors and are virtually the medical officers of health of the provinces. Being, as a rule,

advanced in years, they are not generally energetic, they are not sufficiently well paid, and few of them do much in the way of private practice. Their chances of promotion are very small, and they tend to become inactive and to concern themselves chiefly with office work. Here and there you will find a keen and able man, but, for the most part, the Mudiriya Health Inspectors may be described as genial anachronisms. Genial anachronisms

FIG. 156.—*Imbat 'Agwa* BEING FINALLY PRESSED AND PACKED

After T. W. BROWN

And now we come to one of the most important props of the health fabric in Egypt—the Markaz Doctor—a Markaz being a section or district of a province. It may be a populous and prosperous district, so much so that one solitary medical officer may have as many as 100,000 people nominally under his charge. In such a case the majority die what the old Highlander called "natural deaths," for the doctor cannot get anywhere near them when they are ill. All the same, he probably enjoys a most lucrative private practice, to which his *Government duties* The Markaz Doctor

may or may not play second fiddle. On the other hand, the Markaz may be poor and sparsely peopled—no great catch for the young and pushing graduate from the Kasr-el-'Aini School of Medicine who finds himself in such a district with very poor official pay, say, £E.12 a month, and but little opportunity of supplementing it in any way.

Whether his Markaz is good or bad, however, he is expected to perform the manifold duties set forth on the list shown in Graph 1. One has only to read the long column to realise that in the great majority of cases the Markaz doctor is set an impossible task, at least while his numbers remain as limited as they are at present. He is supposed to deal with infectious diseases both from the clinical and the preventive aspects, much of his time is occupied with medico-legal work, of which there is a superabundance in Egypt, and which often proves remunerative in several directions, and he is expected to control general sanitation. Consider what this means in a large district studded with villages and seamed by canals and irrigation channels. On an ambling ass the Markaz doctor, surmounted by his red tarboosh, jogs hither and thither, often covering many miles a day. He may have to see that a birka is filled up; he may have to inspect a school. The water-supply of a mosque requires his attention; he has to furnish a report on the sanitary condition of a Government building. Questions of the regulation of water intakes fall to his share, as do those of street-cleaning, slaughtering-places, the enclosure of waste lands, and the selection of sites on which town refuse and fosse contents can be dumped.

His multifarious duties

As if all this were not enough, he has still to keep an eye on offensive trades in his district, see to the registration of births and deaths, superintend the vaccination of the community, attend to the dispensary, examine prostitutes in places where there are no hospitals, carry out various duties connected with cemeteries, in one or other of which he must surely sometimes wish he were quietly at rest. Moreover, he attends the meetings of the local commission as public health delegate; he investigates contraventions against the law regarding the practice of medicine; he looks after pilgrims and keeps an eye on such incomers to his district as are under the passenger control regulations. He is responsible for the sanitary state of fairs, he examines and reports on sick Government employees, he also examines the village police, and finally inspects the bodies of those who die uncertified. In addition, he usually earns his living by private practice and, presumably, he eats, drinks and sleeps!

But, you will say, "The poor man must have a large staff under him to aid him in these multifarious duties." Not at all. Look at the graph. It is true that the Omdahs and Sarrafs, head men of the villages, register the births and deaths, but I fear they often give the conscientious Markaz doctor more trouble than assistance. It is true the barber, if he happens to be efficient, may render considerable aid; but, after all, who is the barber? He is merely an unqualified person who, in all probability, has inherited his office, and though he may be highly intelligent and carry out his own minor duties of vaccination, cupping and so forth, in a satisfactory manner, he cannot, in the nature of things, take much of the load off the shoulders of the Markaz doctor. There is no one else; for the dāya, as we have seen, if not negligible, is usually dangerous. It is only when epidemics occur that our harassed friend gets special help, and even that is only in one particular.

Lack of help

In the strict sense of the term there is no sanitary staff whatever, and rural Egypt lies largely at the mercy of the microbe, the helminth and the fly.

Administration in the Governorates

You will note that under the heading "Provincial Organisation" mention is made of the health administration in the Governorates—that is to say, in Cairo, Port Said, Suez and Damietta. Cairo and Port Said have medical officers of health; Suez and Damietta so-called health inspectors.

We considered the conditions in Cairo in our first lecture, and need not recapitulate. Of late years things have altered greatly for the better in certain localities, thanks to hard work on the part of a very capable medical officer of health and to the partial completion of the great drainage scheme, the sewers of which cast their contents upon the desert far from the city and cause it to blossom, if not like the rose, at least like a nosegay, for the trees and verdure of the sewage farm now form a feature of the landscape, and there was never yet a sewage farm without an aroma.

Recently, also, the Public Works Department has been erecting public conveniences in the streets, and these, well-designed and with the latest sanitary improvements, must be regarded as a very considerable hygienic advance. There still remains, however, a great necessity for public drinking-fountains supplying pure water. The latter is available, for there is a large installation of mechanical filters, but it is not to any extent at the service of the poorer parts of the populace.

The Qism medical officers, whom you see mentioned on Graph 1, are really analogous to the Markaz doctors of the provinces, so far as their work is concerned. Each looks after a division or district of the city, and though he has not to traverse great distances like his country confrère, he has more or less the same cheerful variety of duties and has very little leisure to devote himself to what we may call pure sanitation. At the same time, he has assistance which the Markaz doctor lacks, for there are properly organised disinfecting gangs and the rudiments of a sanitary staff.

Cairo

Cairo, indeed, has really made a start in the right direction, though it is still a very long way from a hygienic millennium.

Port Said

Port Said is also somewhat progressive, for, under the British Medical Officer of Health, there is a senior medical man who devotes himself almost entirely to sanitary work, while his junior is entrusted with purely medical duties.

Alexandria

Very different is the state of matters in Alexandria, which, as we have stated, is a municipality, and hitherto has been almost entirely a law unto itself. In other words, it has not been controlled by the Public Health Department. The latter has merely had the power to intervene when some epidemic raging in the city threatens danger to other places —a fine example of shutting the stable-door when the steed has been stolen. The Qism doctors, who are supposed to safeguard the public health in Alexandria, are not trained sanitarians and are permitted to engage in private practice. Though there is a medical officer of health, there is no expert control. There are no qualified sanitary inspectors. Indeed, the whole health administration of this wealthy port is radically wrong, and it is no wonder that the insanitary conditions we described in our first lecture have been the subject of adverse comment in the press, and that repeated outbreaks of typhus fever have evoked well-merited criticism and a clamour for reform.

Future Sanitary Organisation

Public Health Commission

Our review of existing health problems in Egypt is now at an end, and we turn to the future. Shortly after the last Director-General of the Public Health Department retired, the High Commissioner appointed a Commission to inquire into the future organisation and work of that department. Very nearly a year ago the Commission began its sittings, examined many witnesses, studied much documentary evidence, carried out numerous inspections and, in the fullness of time, was delivered of a report, with the salient features of which we shall now deal. Whether or not the problem of hygiene in Egypt will be solved if the recommendations of the Commission are adopted and carried into effect no one can say. Egypt being Egypt, it is quite possible, nay probable indeed, that the proviso will never be forthcoming, at least *in toto*. Still, it may be said that the council of four constituting the Commission found themselves in complete unanimity, and that what public opinion exists in Egypt, generally speaking, approves their findings.

A Ministry of Health

What are the findings? I direct your attention to a new graph (No. 2, *page* 189) and you will note at once the words "Ministry of Health." Despite some evidence to the contrary, the Commissioners were persuaded that the establishment of such a Ministry was essential. The reasons for this belief have already been recorded in the weighty words of Dr. Cyril Goodman, who further states:—

> "The reorganisation of Egypt on constitutional lines, rendered necessary by the Protectorate, offers a peculiarly favourable opportunity of giving public health a place in the constitution commensurate with its importance to the country. Public order, finance, irrigation, agriculture, education and public health constitute the six principal interests of Egypt and the six principal duties of Great Britain towards its Protectorate. The present scheme of government includes in its governing body representatives of each of these interests, *with the exception of public health*. If the policy of Great Britain towards Egypt is to be placed on the broadest basis of material, mental and physical advancement of the people, then public health must be given, without delay, representation on the Council of Ministers, on the Council of Advisers, and it must be recognised as the direct adviser of the High Commissioner on matters of public health.
>
> "It must be frankly stated that those who, while expressing sympathy with the idea, urge delay in its execution must be considered as inimical to the movement itself, for a successful public health policy must grow with the fundamental institutions of the country. It must be built into, not be grafted on, the constitution. If, therefore, the importance of public health in Egypt is sufficiently great to justify its inclusion as a Ministry amongst those which direct the policy of the country, then it is clear that during, and not after, the remodelling of the institutions of the country is the proper time for that inclusion."

Urgent need for Ministry

It remains to be seen how such a Ministry should be constituted. At its head there must, of course, be a Minister—an Egyptian—and he must be an official thoroughly versed in public affairs, interested in the welfare of the people, in social problems and in scientific progress. It is not impossible to find such a man in Egypt, and, once found, his words would carry great weight in the Council Chamber. He need not of necessity be a

The head of the Ministry

[1] The Commission was composed as follows:—President: Lieut.-Colonel Andrew Balfour, C.B., C.M.G., R.A.M.C. Members: Lieut.-Colonel G. E. F. Stammers, R.A.M.C.; Mr. E. S. Crispin, Director, Medical Department, Sudan Government; and Dr. Charles Todd, O.B.E., Director of Laboratories, Department of Public Health. Secretary: Mr. H. Sheridan.

medical man. Indeed, the appointment of a layman would possess certain advantages, as it would ensure that the Minister of Health was on the same footing as other Ministers, was appointed for the same political reasons, and would be interchangeable with them if a Ministerial rearrangement was required. In immediate command it is essential to have a British Under-Secretary of State, a medical man, who must needs possess a long and intimate knowledge of health matters in Egypt and be conversant with the intricacies of governmental machinery in that country. He will control the sanitary, epidemic and medical work of the Ministry. As a glance at the graph (*page* 180) shows, there will be a Department of Medical Education under him, a new departure and one necessitated by the present state of Egyptian affairs. His duty will be to frame future policy and indicate how health legislation should best be carried out, to see that the work is conducted upon a sound scientific basis and that scientific research, which alone can point the way to reform, receives due encouragement. He must also be capable of taking that broad view on which so much depends, and possess those qualities of tact and firmness which count for so much in Eastern lands. Finally, as the Commission reported, "it is essential that he should have direct access to the High Commissioner, so that, armed with the weapons of an expert, he may be able to plead his cause to good effect."

The main driving force of the Ministry will, however, undoubtedly be the Director-General, *who should not be too old a man. Public health work is a campaign against* Field-Marshal Death and his redoubtable generals—to wit, Dirt, Destitution, Disease, Ignorance, Superstition and, by no means the least doughty, the fighter with the double-barrelled name, General Vested-Interests! Hence, as in war, the commander must unite a certain degree of youthful energy and vigour with the experience and powers of judgment which are so necessary. Not only must he be a capable organiser, but he must combine strength and sympathy in his work, for, lacking sympathy, he will probably fail in a land like Egypt. *The Director-General*

The next post is a new one, though it exists unofficially. It is that of Technical Adviser and Director of Medical Intelligence. I am not sure but that it is the most important of all, and, though the duties of the post would be chiefly advisory, its holder would not be wholly divorced from administrative work, for, as you will observe, he would control the scientific side of the Health Ministry in so far as hygiene is concerned. Here is what the Commission say about this appointment:— *The Technical Adviser*

> "We consider a post of this nature to be of the very greatest importance. The Technical Adviser would not only act in that capacity to both the Under-Secretary and the Director-General, but he would conduct a Bureau of Information. Controlling the main library, keeping himself closely in touch with what goes on in other countries, studying the vast literature, corresponding with similar departments of other Governments, he would be in a position to furnish invaluable information to the chiefs of the various Sections, and, by issuing instructive pamphlets and circulars both to public health officials and to the medical profession in Egypt, he might speedily make the Ministry of Health a real power in the land. Moreover, he would collect and collate information from local sources, so that at any time he would be in a position to advise on problems arising in Egypt itself. The lack of a bureau of this kind in the Medical Department of the British War Office has made itself severely felt in the various tropical and sub-tropical areas of hostilities. Such work, properly carried out, effects great saving in both time and money, and possibly does more than anything else towards making a Government Department really efficient and *up to date*."

A museum of medicine and hygiene

A further proposal of the Commission is the establishment of an Egyptian Museum of Medicine and Hygiene, which would be of an educational nature, and, under the guidance of the Technical Adviser to the Health Ministry, should prove itself a stimulus towards sanitary reform. It is not suggested that this should be a Government undertaking. So truly national a project may well find support amongst the wealthy and influential of Egypt. As the Commissioners remark:—

> "There is undoubtedly a need for some such institution in Egypt, where, in a graphic manner, information will be furnished, both to officials and to the populace generally, as regards the diseases of Egypt, the insanitary conditions prevailing in the country, methods of dealing with epidemics, and means of rendering towns and villages clean and healthy. The work of hospitals and dispensaries would be illustrated, the rôle of insects in disease explained, the danger from faulty and deficient dietaries set forth, together with measures of prevention and cure. In fact, a great centre of instruction would be established—a school where one might learn with little effort, where interest would be excited and sympathy aroused."

Sections of the Central Administration

Board of Health

At this point I may mention that the Commission recommended a Board of Health for Egypt, a body which undoubtedly would be of benefit in many directions.[1] The results of its deliberations, as suggested by Dr. Goodman, should be published for the information of the public. We need not here enter into the question of its constitution, but will continue our consideration of the Central Administration under the new scheme. Three of the sections we previously discussed become departments and one disappears, the ophthalmic section being, for purposes of economy and facility in administration, attached to the Department of Medical Services, which is the old hospital section.

The new Department of Sanitary Services will require a director intimately acquainted with Egyptian conditions. His duties have been set out in rather more detail than were those of the director of Section I, and the only one of them to which reference need now be made is that indicated by the term "Sanitary Training Centres." As will in due course be seen, these are intended as schools of sanitation for training certain inspectors of nuisances whom it is proposed to create for the purpose of dealing with village sanitation. The latter, which, as you will see, heads the list, is perhaps best considered under the proposals for provincial administration.

The Department of Epidemic Services shows little change from Section IV, save that the suggestion is made to bring sea quarantine under it. This is a difficult matter, for it involves complex international questions, and no one can say how it will yet be settled. Inland water transport is mentioned, as it plays, or may play, an important part in the spread of plague and cholera when these diseases are epidemic in Egypt.

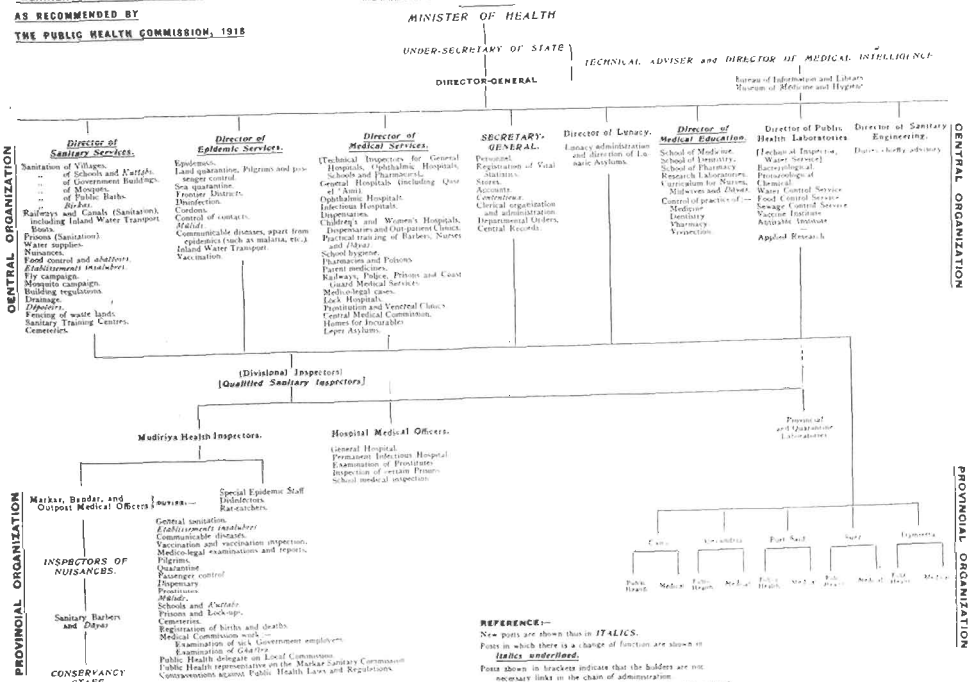
The Hospital Section becomes the Department of Medical Services, and the shortcomings which have been mentioned indicate the measures required for their remedy. In addition to an increase in general and infectious hospitals, and a new policy as regards the treatment of prostitutes in the former, it is essential that technical inspectors be appointed to visit periodically the 23 general government Hospitals and to reside in them

[1] It is encouraging to note that a Consultative Council of Hygiene, or Board of Health, was established by an Arrêté of the Ministry of the Interior in December, 1919.

GRAPH No. 3

MINISTRY OF HEALTH

ORGANIZATION OF HEALTH MINISTRY AS RECOMMENDED BY THE PUBLIC HEALTH COMMISSION, 1918



REFERENCE:—

New posts are shown thus in *ITALICS*.

Posts in which there is a change of function are shown in *Italics underlined*.

Posts shown in brackets indicate that the holders are not necessary links in the chain of administration.

N.B.—An additional copy of this Graph will be found in the wallet at the end of the book

from time to time for limited periods. In some of these hospitals, also, post-graduate courses might with advantage be instituted.

The Medical Service of the Ministry of Education might with advantage be brought under the control of the Ministry of Health. The medical inspection of school children in Egypt is of the highest importance and requires to be developed with the help of technical inspectors. It will be seen that those medical services which have been outside the fold or have strayed from it are to be shepherded into it, so that the whole health work of the country may be properly co-ordinated, while the medico-legal work no longer figures under general sanitation, but is brought into this department. It would, indeed, be well if some of the burden of this class of work could be borne by the Ministry of Justice, but the question is a difficult one, and the Commission had to content itself with expressing some pious hopes in that direction. Certainly a great deal of the time of the Markaz doctors is taken up with duties which are nearly as much legal as medical.

Absorption of other medical services

The medical control of prostitution and venereal diseases has been relegated to this department, and only those who have carefully studied the problem in other countries can appreciate all that it involves. More lock hospitals are required, clinics for the treatment of venereal diseases must be established, the populace must be instructed and facilities for preventive treatment provided. The whole question bristles with difficulties, but we know that these exist to be overcome, and money and determination and, above all things, common-sense, can work wonders.

As regards provision for incurables and lepers, I cannot do better than quote again from the Commission's report :—

Provision for incurables and lepers

"Homes for incurables would meet a great need in Egypt. The country is full of crippled and debilitated mendicants, for whom little or nothing is done. The *tekiyas* of the Ministry of Waqfs deal with a few incurable cases, but the number of these establishments is quite inadequate. These unfortunate individuals are often beggars, are liable to become foci of infection, and present a problem which can only be solved by making provision for them. Even then, only a certain proportion of them can be housed, but this will help in some measure. So far as Cairo and its neighbourhood is concerned, the proposed transference of Qasr el 'Aini Hospital from its present site would leave vacant a suitable building for a hospital for incurables; others, however, are required in various parts of Egypt. This is not work for the Ministry of Health, except as a controlling and inspecting body.

"It would appear to be the privilege of the Waqfs Medical Services to make such provision. Amongst charities, that which benefits the aged, the infirm, and those who are beyond the skill of the physician and surgeon surely holds a high place. It is true that some Waqfs are allotted by their donors for definite purposes, but we are assured that there are ample funds on which there is no reservation and which might well be devoted to this good cause.

"Closely associated with the question of incurables is that of lepers. We have been unable to obtain any reliable statistics as regards the present prevalence of leprosy in Egypt, but there is undoubtedly a number of lepers in certain places—for example, Damietta. There is nothing to prevent them from handling foodstuffs intended for sale; and though leprosy does not appear to spread much in Egypt, and though the channels of communication from the sick to the sound are not fully known, such risks should certainly not be permitted. Even if, from the public health point of view, it may not seem very necessary to segregate lepers in Egypt, there is the humanitarian aspect of the case to be considered, and an asylum is undoubtedly required for maimed and helpless lepers, as well as for those who are probably an active source of infection. A leper colony in which work could, to some extent, be carried out on the land would be a wise provision, and the attention of the Ministry of Waqfs might well be drawn to this charitable object."

Lunatic Asylums

It will be seen that the lunatic asylums should form a section of the Health Ministry under a Director of Lunacy. This is in accord with the modern trend of thought as regards the work of the alienist. Lunatic asylums are, however, so specialised that they cannot be grouped with other hospitals, but must form a separate department.

Medical Education in Egypt

School of Medicine

And now we reach a very important subject—that of medical education in Egypt, which, however, can only be very briefly considered. We saw that the Kasr-el-'Aini School of Medicine owed its foundation to Clot Bey. It has proved, especially of late years, a most useful institution both in the way of teaching and of research, and its professoriate has included men of European reputation. Unfortunately, the school is now too small to meet the needs of the country, and, though it attracts the intellectual élite from the secondary schools, the Ministry of Education has to refuse many applications owing to lack of accommodation. The vast majority of the students who pass through the school find employment in the Public Health Service, and in the absence of any University system in Egypt, it is deemed advisable to bring medical education into the Ministry of Health, there to be placed under the control of a director, who must of necessity be given a free hand, not only as regards medical education, but with respect to the training of dentists, pharmacists, nurses, midwives and dâyas. Medical research work, demanding access to clinical material and requiring the calm of academic surroundings for proper development, would be conducted in the laboratories of the school of medicine and would be distinct from the applied research work of the public health laboratories, which is of a different type though equally important.

Curriculum

The curriculum of the school can be improved in certain directions, as by establishing instruction in diseases of children and in protozoology. A chair of hygiene should undoubtedly be instituted and a diploma granted, either in public health alone or in tropical medicine and hygiene.

Teaching Hospital

Like the medical school, the great teaching hospital of Kasr-el-'Aini requires extension and improvement. Indeed, a new building on a new site has long figured on a programme which has never been fulfilled. Facilities for dispensary work might prove valuable, and the question of training Egyptian women doctors is one meriting serious consideration.

Board of Control

In Egypt there is also great need for a powerful Board to control the practice of medicine, dentistry and pharmacy, and to deal with all questions of malpraxis and vivisection.

Expansion of Public Health Laboratories

It will be seen from the graph (No. 2) that it is proposed in certain respects to expand the work of the Public Health Laboratories. Protozoology requires more attention than hitherto, and food control and sewage control services must be established. As will be noticed, there is a plan to decentralise the work in some measure by means of provincial laboratories, while the existing quarantine laboratories should be brought under the sway *of the Director of Medical Intelligence. The chief sanitary engineer of the old graph* becomes a Director of Sanitary Engineering, a subject which will undoubtedly become increasingly important as schemes for drainage, water supply, disinfection and so forth develop.

The Solution of Provincial Administration

Such are the main recommendations of the Commission as regards central organisation. Let us see how it proposes to solve the problem in the provinces. Recognising that there are far too few divisional inspectors, it recommends an ample increase in their numbers and insists that they should live in their districts, be housed, well paid, and given every facility for getting about rapidly. Opportunities should also be afforded them for seeing in rotation something of the Central Administration and gaining an insight into the work of those departments of the Ministry, the chief posts in which some of them will one day fill.

Introduction of the Sanitary Inspector

There is nothing very novel in these recommendations, but an entirely new idea, so far as Egypt goes, is voiced by the suggestion to introduce qualified British Sanitary Inspectors, one of whom would be attached to each divisional inspector to aid him in his work and, under certain conditions, to train those inspectors of nuisances whom we have mentioned and who figure in graph No. 2. There can be no doubt that intermediaries of this kind are greatly needed. If the right class of man is obtained—and he should be forthcoming in greater numbers now the war is at an end—he should go a long way towards solving some of the problems I have mentioned, for efficient inspection means everything in this kind of sanitary work. Qualified sanitary inspectors of this type have proved their value in the Sudan. They are employed under the Colonial Office administration in various parts of Africa, and I hope to see the day when it will be possible to train them in the rudiments of tropical hygiene before they leave this country for their posts abroad. Their ordinary training is excellent so far as it goes, but at present time is wasted after they reach the Tropics in giving them instruction in anti-mosquito measures, in native habits and customs, in conservancy methods in vogue in hot countries, in new aspects of the fly question, in those improvisations which form so great a part of the sanitarian's outfit abroad, and in all those *minutiæ* which mean so much and which can perfectly well be imparted to them by one having experience. It is true that many have become *au fait* with these matters during the war, but we have to think of the future, and the sooner this training is instituted the better for the Empire. It has been too long delayed.

We need not again consider the strictly medical work in the provinces, but from what has been already said it is clear that the Mudiriya health inspectors should be better paid and have better prospects.

The posts should be filled by younger and more energetic men who may be expected to take an active interest in their duties, especially if they are diplomates in public health.

Two categories of Markaz doctor

And now we come again to our friend the Markaz doctor. What is to be done about him and his manifold perplexities? Two courses may be followed.

The ideal scheme, and one which eventually must be adopted, is to divide the Markaz doctors into two categories according to the work, sanitary and medical, as shown in the subjoined table:—

Markaz doctor in charge of Public Health work (excluded from private practice).	Markaz doctor in charge of medical work (allowed private practice).
General sanitation.	Communicable diseases (clinical).
Etablissements insalubres.	Medico-legal examinations and reports
Communicable diseases (public health aspect).	Dispensary.
Vaccination and vaccination inspections.	Prostitutes.
Pilgrims.	Medical Commission Work :
Quarantine.	Examination of sick Government employees.
Passenger control.	Examination of *ghafirs*.
Midids.	Prisons (in certain places).
Schools and *Kuttabs* (sanitation).	Schools (medical).
Prison lock-ups (sanitation).	
Cemeteries.	
Registration of births and deaths.	
Public health delegate on Local Commission.	
Public health representative on the Markaz Sanitary Commission.	
Contraventions against public health laws and regulations.	

Division of labour

The Markaz doctor engaged on sanitation would not be allowed private practice, would be freed from medico-legal work, and would have an initial salary of £E.25.30 a month. He would also be pensionable. From this category the Mudiriya health inspectors would be chosen.

The Markaz doctor engaged on medical work would be paid as at present, would carry out the official duties listed in the above table, and would be on contract until found satisfactory. He could then be placed on the cadre. As is now the case, his chief prospects would be in the direction of private practice.

Unfortunately, at present this scheme cannot be carried into effect, for there are not enough Markaz doctors in Egypt, there are not enough private practitioners, there are not sufficient medical graduates. Still, it might be tried on a small scale in certain districts—a course the Commission recommended.

Provisional measures

The second plan is to multiply the number of doctors in each Markaz, strictly defining their respective areas, and making no change in the nature of their work or in their pay. Even this simple solution of the problem will be difficult of realisation until the medical school is enlarged and is able to cope with the medical needs of the country.

How true is the old proverb—"Things move slowly in the Nile Valley!" "Haste," however, we know, "is begotten of the devil," and if we can only combine the slowness with sureness no great harm will be done, provided that slowness does not degenerate into sluggishness—a very different affair.

Inspectors of nuisances may be recruited from the ranks of the better educated sanitary barbers or from men of the artisan or mechanic class, or possibly even from ex-non-commissioned officers of the Egyptian Army. Trained by the sanitary inspectors, paid out of local funds, in close touch with the people, the inspector of nuisances would supervise the scavenging and cleansing of villages, and, if village latrines and incinerators prove feasible, he would see that they are properly used and kept in repair. He would

The inspector of nuisances

inspect water supplies, markets, birkas and other mosquito-breeding places. He would endeavour to show the people how their villages could be improved and how they could live in more cleanly and also more comfortable surroundings. He should have some knowledge of building construction, and of the rôle of flies in the spread of disease.

The sanitary barber

The sanitary barber, who should also be paid, would, in addition to his present duties, furnish information on matters of public health interest occurring in the village, while a conservancy staff would represent the lowest rung in the sanitary ladder.

Here, then, is a definite system, providing, apparently, for all contingencies, costly no doubt, but not unduly so, and avoiding too heavy a strain upon the central treasury. It remains to be seen if it will be adopted in its entirety and, if adopted, how it will serve the medical needs of Egypt. It has been said that the report of the Commission afforded cause for complaint by the Egyptian Nationalists, inasmuch that, save in the case of the Minister, all the higher posts in the Health Ministry were allotted to Britishers. The statement is doubtless true, but requires to be qualified, for, owing to the lack of technical training which has been mentioned, there are at present no Egyptian doctors capable of holding these posts. Furthermore, I would like to point out that the Commission expressly recommended an improvement in the status and pay of the Egyptian Mudiriya health inspectors and advocated their advance to divisional inspectorships as soon as possible. Their report also provides for a large increase of Markaz doctors and the creation of a new class of Egyptian employees—namely, the inspectors of nuisances. The national aspect of the question was duly and sympathetically considered and, as has been stated, recommendations were made which, if carried into effect, will create a body of Egyptian hygienists capable of serving their country to the best advantage in the interests of the public health.

The working-out of the scheme

In the case of the individual towns, measures closely resembling those just detailed must be applied. Cairo requires qualified sanitary inspectors and inspectors of nuisances. So does Alexandria. The latter city must no longer be permitted to act as a law unto itself in public health matters. The Commission recommend that a Controller be appointed by the Ministry of Health, which itself should approve all public health appointments. The Qism doctors should not be allowed private practice, and should devote their whole time to public health duties, in which they should be specially trained. In short, a radical change is needed if the stigma now resting on the city is to be removed and the health of its populace safeguarded. At the same time, it is only fair to state that the chief engineer of the municipality has been busy with schemes for replacing the ecbèches, of which I spoke in the first lecture, by model dwellings (Fig. 157). Building regulations have also been framed and a town plan introduced, so that the outlook is distinctly more hopeful.

Application to urban areas

As regards other towns, the method in vogue at Port Said may be followed with advantage until such time as each is able to work out its own sanitary salvation on a sound basis of local self-government.

Time does not permit a discussion of other points considered by the Commission, such as the future of the medical services of the Ministry of Waqfs, that department which

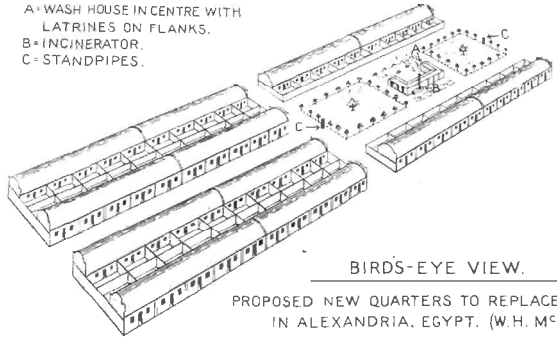
controls large funds earmarked for charitable purposes; the amendment and progress of public health legislation; the dissemination of information; and the great desirability of lay officials taking a real interest in sanitary reform and keeping themselves acquainted with what is happening in the hygienic world of Egypt.

The Removal of a Reproach

It all sounds very simple, but in reality how hard it is to make headway against ignorance, inertia and prejudice! Let us, however, hope for the best.

Along with this reform, or rather advance, in public health administration, an active campaign should be instituted against these three deadly enemies of the fellaheen — bilharziasis, ankylostomiasis and pellagra. Leiper and his colleagues have already thrown much light on the first-named; we know a great deal about the second; the third alone remains a mystery. Given money and research on sound lines, the mystery will assuredly vanish, and, given funds and a progressive sanitary policy, the people of Egypt will be freed from the burden of all three diseases. Hope for the future

I have spoken in vain if it is not apparent that the sanitary condition of Egypt still remains in many respects a byword and a reproach. Great Britain has declared that ancient land a Protectorate, and has protected it from the Teuton and the Turk on the east and the Senussi and the Turk on the west. There are, however, other foes of its own household, and unless this country realises its responsibilities and undertakes to rout the forces of disease which hold Egypt in thrall, it will have failed in its duty, and one day there will be written of it, as there was of Belshazzar of Babylon, "Mene, mene, tekel, upharsin"—Thou art weighed in the balances, and art found wanting. . . . . .



BIRDS-EYE VIEW.

PROPOSED NEW QUARTERS TO REPLACE ECHÈCHES IN ALEXANDRIA, EGYPT. (W.H. McLEAN)

Fig. 157

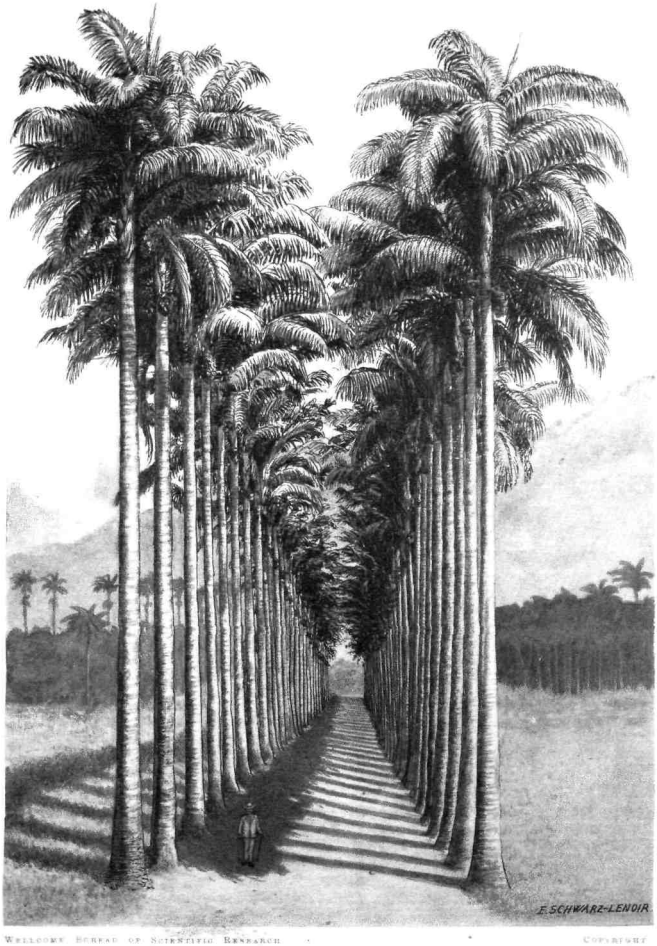


FIG. 158.—A COLONNADE OF PALMS (*Oreodoxa oleracea*, MART.)
THE WEST INDIAN CABBAGE PALM

THE PALM FROM A SANITARY STANDPOINT

THE injunction to "consider the lilies of the field" must often have formed the text of a sermon, but there is no evidence to show that the palm of the forest has been similarly honoured. Yet in the vegetable kingdom the palm tree in its infinite variety, in its beauty, in its fruitfulness, in all that it means to man, must ever hold a foremost place. It is not too much to say that in certain parts of the tropical world, notably in regions of South America, human life would be impossible without the palm.

Many books and numerous articles have been written on the uses to which palm trees have been put, but there is still room for a comprehensive and up-to-date volume on the palms of the world in this connection. Such a volume would be a weighty tome and could only be written by one who was a skilled botanist with an extensive knowledge of the Tropics and an equally extensive knowledge of tropical life and tropical industries. There is, however, a side to the economics of the palm which, so far as I know, has never been considered within the compass of a single paper, and that is the hygienic relations of the palm to man. *Palm trees*

The word "hygiene," in its widest sense, covers such a multitude of subjects, and the palms and their products possess such sanitary importance, that it is impossible to condense our knowledge of these hygienic relations into an article of reasonable dimensions. The attempt will not be made. It is proposed merely to discuss certain aspects of what is undoubtedly an interesting subject, and to do so in a manner which may possibly appeal to the general as well as to the scientific reader.

There is a hygiene of the mind as well as of the body—a fact apt to be forgotten in tropical sanitation. Anything which serves to dispel the tedium and monotony of life, so often experienced in hot countries, is beneficial, and hence, the mere sight of some of the more noble palms may exert an influence alike soothing and stimulating and induce a frame of mind calculated to lift the tropical resident above the petty worries and discomforts inseparable from the climatic conditions under which he lives. As CHARLES KINGSLEY says:— *Their beauty and their value to man*

> "It is a joy for ever, a sight never to be forgotten, to have once seen palms breaking through, and, as it were, defying the soft rounded forms of the broad-leaved vegetation by the stern grace of their simple lines; the immovable pillar stem looking the more immovable beneath the toss and lash and flicker of the long leaves, as they awake out of their sunlit sleep, and rage impatiently for a while before the mountain gusts, and fall asleep again. Like a Greek statue in a luxurious drawing-room, sharp-cut, cold, virginal; shaming by the grandeur of mere form the voluptuousness of mere colour, however rich and harmonious: so stands the Palm in the forest to be worshipped rather than to be loved."

One has felt some similar uplifting of spirit when gazing at the long lines of coco-nut palms swaying and swishing in the blast of the trade wind on the eastern coast of

Their influence on the mind

Trinidad, or when standing in the deep shade at the base of some slender giant in the heart of the High Woods and looking upwards through a green and chequered screen to catch a glimpse of the feathery palm crown spreading in the brilliant sunlight against a sky of vivid blue. Again, there is a satisfying sense of beauty in an Egyptian date grove and a welcome contrast to the sterility of the surrounding desert, while a group of stately Miritis, the fan-leafed social palms of South America, or an avenue of magnificent Royal Palms, as seen in Cuba, is well calculated to charm the eye and divert the mind. The

FIG. 159.—DENSE GROVE OF DATE PALMS AT BASRA, MESOPOTAMIA

Indians call the Miriti "the tree of life," a name which might also be applied to many of its brethren, even when considered only from the standpoint of their influence upon mentality. But, in a much wider sense, many of the palms are trees of life.

Their gifts to the body

As Linnaeus said: "Man dwells naturally within the Tropics and lives on the fruit of the Palm tree; he exists in other parts of the world, and there makes shift to feed on corn and flesh." But it is not only food that the palms furnish. They provide drink—both harmless and intoxicating. Food preservatives are made from them. They supply shelter and clothing. Oil and wax, substances of hygienic value, are obtained from them, as are the bristles of that humble but useful sanitary implement the broom.

Native combs, which play a part in personal hygiene, are fashioned from the spathes of at least one species of palm, and alkaline ashes from palm leaves are prized by native washerwomen. The leaves themselves may serve as punkahs or be woven into baskets in which food can be transported in a cleanly manner and protected from flies and other insect vectors of disease. Utensils for holding drinking-water, aqueducts and sweeps for wells are made from palm wood. Palm products are found in common dentifrices, a fact which serves to remind us that the palm in some form or other may be concerned with the health and well-being of man outside the Tropic belt which forms its home.

FIG. 160.—COCO-NUT PALM (*Cocos nucifera*, LINN.)
From a Photograph by Dr. MANSFIELD-ADERS

As will be seen, the palm is for the most part a friend of the hygienist, but this is not always the case, though, truth to tell, it is not on all occasions the tree which is at fault when a black mark has to be registered against it. As is too often the case, man, the muddler and the meddler, is frequently to blame. He exploits the palm and forthwith commits a nuisance from folly, ignorance, or carelessness. Still, at times and under certain conditions, the palm, even when left to nature, is a source of danger or annoyance, but its virtues far outweigh its misdeeds and merit pride of place in any consideration of its hygienic relationship to man. Dividing the latter into its several aspects, we commence our consideration with the question of—

A friend of the hygienist

Shelter.—Leaving out of account for the present the part which the palms play in the construction of head-cover and habitation, we may note that they do not rank high amongst the shade trees. For the most part they are too lofty to be of service in this direction, and they lack the umbrageous quality of certain of the tropical figs, the Albizzias and other useful shade trees, albeit one of the Raphia Palms has a leaf which covers a surface of 200 square feet. Where the palm belongs to a desert species,

Shelter

such as the Date (*Phœnix dactylifera*, Linn.) it may afford very welcome shelter against a fiery sun (*see* Fig. 159, *page* 198). A dense date grove in an oasis has often been joyfully hailed by the weary traveller on his camel, who is fortunate if he can rest therein during the hot hours of the day.

Date groves

It must be confessed, however, that it is possible to have a surfeit of Date Palms. For example, there are many who can testify against the far-reaching date gardens of Basra. In a country like Southern Mesopotamia a good breeze means a great deal from a hygienic standpoint, and on either bank of the Shatt-el-Arab the wind has little chance of free play, owing to the countless sturdy and rugged stems of the Date Palms and their heavy canopy of pinnatisect leaves.

FIG. 161.—PREPARING TAPPA CLOTH FROM THE LEAVES OF THE COCO-NUT PALM IN FIJI
Photograph by Dr. P. MANSON-BAHR, D.S.O.

Moriches

The country about Ciudad Bolivar on the Orinoco is dry, arid and dusty, so that it is little wonder that the wealthier inhabitants seek refuge in neighbouring oases called *morichales*. These are spots green with grass and trees, prominent amongst the latter being Moriche Palms, which belong to the family Mauritia. These are the same as the Miriti Palms already mentioned, and there are several species—*M. flexuosa*, Linn. f.,

Fig. 162.—The Palmyra Palm (*Borassus aethiopum*, Mart.)

Fig. 163.—Astrocaryum vulgare, Mart.

being a very noble palm, sometimes attaining a height of 100 feet. These Moriche Palms grow in moist places and, by their shade, keep the ground damp, so that there is much verdure around them, and the morichales are very pleasant spots on a hot day in Venezuela.

Another kind of shelter in the Tropics is afforded by clothing, and more especially by wide-brimmed hats, and various species of palms furnish the wherewithal for the fashioning both of garments and head-cover. Some of the South Pacific islanders, when busy at field-work or fishing, array themselves in a kind of cloak made from the network

Clothing

at the base of the petiole of the Coco-nut tree, *Cocos nucifera*, Linn. (*see* Fig. 160, *page* 199). It is durable and not easily damaged by water. The husk of the coco-nut itself is woven into hats; but better hats, from the tropical point of view, are constructed from the leaves of various species of palms as, for example, the well-known Palmyra, *Borassus flabellifer*, Linn. (*see* Fig. 162, *page* 201), one of the great palms of Asia, and which in Africa is represented by its variety, *æthiopum*, the Black Rum Palm of the West Coast, the Deleb of the Sudan. The spiny *Astrocaryum vulgare*, Mart. (*see* Fig. 163, *page* 201), of South America, possesses leaves which, when young, are well adapted for hat making, as does another useful palm, famous throughout Brazil, the Carnauba, *Copernicia cerifera*, Mart. (Fig. 165).

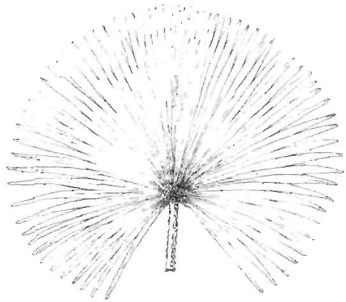


FIG. 164. "TOKO-PAT" (Leaf of *Livistona jenkinsiana*, GRIFF.). (From *Les Palmiers utiles et leurs produits*, Griffard and Vanden Berghe)

Nor do these exhaust the list, for hats are manufactured also from another fine Brazilian species, the Bussú, *Manicaria saccifera*, Gaertn.; from the diminutive *Sabal mexicana*, Mart., which, in Chiapas and Tabasco, is planted for the purpose; and from two East Indian Palms – the "Chattah-pat" of the Assamese, *Licuala peltata*, Roxb., and the "Toko-pat," also of Assam, *Livistona jenkinsiana*, Griff. (Fig. 164), both of which yield the big umbrella hats under which the Assamese proceed to market.

Habitations

Yet a third kind of shelter, and that the most efficient and most lasting, be it from sun or rain, is found in the dwelling, and we note that palms enter very largely into the construction of native houses in every part of the tropical world where they flourish.

Throughout Northern Africa the trunk of the Date Palm is found invaluable for supplying posts and rafters for the mud-brick habitations which form the common type of building in these regions, and it is used also in more ambitious structures. In some places the very poor inhabit shelters entirely constructed of Date Palm leaves. The Asiatic Borassus has a very durable wood, and it is said that rafters made of it last more than a hundred years. The split stem is frequently employed as a rain gutter to carry away water from the house-eaves (*see* Fig. 180, *page* 219).

Fig. 165. – Copernicia cerifera, Mart.

Fig. 166. – Ceroxylon andicola Humb. and Bonpl.

The Coco-nut palm

The Coco-nut Palm, a veritable Whiteley or Harrod of the vegetable world, supplies excellent building material, its trunk being converted into posts, pillars and beams once the tree has ceased to bear fruit. Moreover, in Ceylon, the milk of the green nut is worked up with lime and is stated to improve the adhesive qualities of the whitewash with which house walls are plastered.

Although it may anticipate a little, we may here quote what DICKENS said about this marvellous palm in that defunct but once popular publication *Household Words*. He long ago wrote :—

> "When the Singhalese villager fells one of these trees after it has ceased bearing, with its trunk he builds his hut and bullock stall, which he thatches with its leaves. Slips of the bark are used for bolts and bars, and the plot of chillies and grain is fenced with its leafstalks The infant sleeps in a net of coir string from the husks. The meal of rice and grated coco-nut boiled over a fire of coco-nut shells and husks, is eaten out of a dish formed of the plaited green leaves with a spoon cut out of the nut shell. His torch is composed of a bundle of the dried leaves and flower stalks, fishing nets of the fibres, and the canoe is the trunk of the tree. He drinks the fresh milk of the nut, eats the soft kernel, drinks toddy (unfermented juice), flavours his curry with its vinegar, sweetens his coffee with its jaggery (sugar), and softens it with the milk. The wood forms the doors, windows, shelves, chairs, and the water-gutter under the eaves. Spoons, basins, mugs, salt-cellars and jars are made from the shell."

And yet perhaps the palm must be given to the Borassus, for WILLIS states that the Tamils have a song enumerating 801 uses to which it may be put.

The leaves of a species of Corypha are utilised in Bengal for fastening roof rafters, while the South American, *Socratea exorrhiza*, H. Wendl., yields a wood admirable for ceilings. That of an allied but mountain species, *Ceroxylon andicola*, Humb. and Bonpl. (*see* Fig. 166, *page* 203), found high up on the flanks of the Andes, is also most serviceable, being remarkably durable. On the Rio Negro the Indians make use of the trunk of *Mauritia vinifera*, Mart. (Fig. 167), one of the smaller Miriti Palms, in building their mud cabins, and the leaf-stalk of the superb *Raphia vinifera*, Beauv., enables the Indian of the lower Amazon to house himself in comfort.

The Nibong Palm of the Malays, *Oncosperma filamentosa*, Blume, provides posts, rafters and flooring; and the Nipa Palm, *Nipa fruticans*, Thunb., also an East Indian species, has a leaf stalk employed for the floor and framework of huts.

Palm roofs

Equally valuable are the services rendered by many palms in the construction of roofs. Practically all those mentioned, and many others, bear leaves which can be converted into good thatch.

In the plains of Venezuela and Colombia, one finds *posadas* and other dwellings built from the hard wood of *Copernicia tectorum*, Mart., and covered with its leaves. HUMBOLDT says that this class of roof will last for more than twenty years, a remarkable testimony to their efficiency, considering the torrential rains which flood the llanos at one period of the year. Even more remarkable, however, is the statement of MARSDEN regarding the Ejoo of the Gomuti, *Arenga saccharifera*, Labill. This Ejoo is a material resembling coarse, black horsehair, and is found covering the base of the stout petioles. It is fastened as a thatch and is so durable as never to need renewal, for of all vegetable substances it is the least liable to decay. Indeed, this quality causes it to be wrapped round the ends of timbers and posts which are to be fixed in the ground. There is actually a palm called the Thatch Leaf Palm, *Howea forsteriana*, Becc. (Fig. 168), from Lord Howe Island, an example of which may be seen at Kew.

Fig. 167 – Mauritia vinifera, Mart.

Fig. 168 – The Thatch Leaf Palm
(*Howea belmoreana*, Becc.)

In Sikhim and Nepal the reedy stems of certain species of the climbing Calamus Palms are used in the green state as roof-ties, owing to their great strength and resiliency.

SEEMANN has an interesting note on the hygienic properties of roofs ingeniously fashioned in Brazil from Bussu leaves. He says that the latter "are split down the midrib and the halves laid obliquely on the rafters, so that the furrows formed by the veins lie in a nearly vertical direction, and serve as so many little gutters to carry off the water more rapidly."

Palm-leaf thatch has, however, certain drawbacks, for it is apt to shelter rats, and, according to Dr. MANSFIELD-ADERS, when termites get amongst it they cause showers of dust to fall within the hut or cabin, and dust frequently harbours fleas and other vermin. The inflammable nature of these roofs may be a disadvantage in some respects, but from a sanitary standpoint may be beneficial, as when a fire licks the thatch off unhygienic dwellings which may have sheltered cases of tuberculosis, so common amongst crowded native locations. Such a fire, as Dr. SPURRIER, of Zanzibar, has pointed out to me, not only destroys the roofs but calcines the walls and must exert a certain sterilising influence.

Food.

Food.—If the palms furnish shelter they also provide sustenance in great variety and of excellent quality specially adapted to tropical needs. It has been well said that the indigenous products of a tropical country are more suitable as food for the inhabitants than any which can be imported from another land having a totally different climate. Nature has provided for very hot climates the carbohydrate foods as contained in cereals and fruits, and the latter come largely from the palms.

But there is a form of food, or rather of "bonne bouche," derived from some palms which has nothing to do with fruit. A certain weevil in Trinidad and South America delights to lay its eggs in the juicy pith of the lofty and stately West Indian Cabbage Palm *Oreodoxa oleracea*, Mart. (Fig. 160), and no sooner is a tree felled than the beetles convert its trunk into a nursery. In due course the eggs become larvæ, which feed on the pith and grow apace. In a fortnight or so the grubs have become fat and succulent (*see* Fig. 170, *page* 208). They constitute a delicacy and are removed, stored in water and duly fried or roasted, being spitted on a skewer.

Weevil grub

Sir DAVID PRAIN has kindly drawn my attention to a peculiar way in which certain palms become associated with a food-stuff prized on the western littoral of India. The food-stuff is Mahwa butter, which is a good edible oil derived from the seeds of *Bassia latifolia*. Now a similar butter is obtained from the allied *B. longifolia*, and this, being a cultivated tree, is the species of Bassia with which we are specially concerned in the present instance. The fruits, when ripe, are gathered in May and June. A fleshy covering coats the nut-like seeds, which yield the fat after crushing. It is not easy to get rid of this covering. What happens? There are, happily, flying-foxes in this part of the world, and these come to the assistance of man. The flying-fox is not concerned with the seeds and their fat, but he does want the fleshy covering. He cannot deal with it when on the wing nor when he is hanging upside-down on his perch. Hence he requires a table for his feast, and he finds one in the broad fan-like leaf of the Borassus or Corypha Palm. The latter has the bigger leaf and therefore provides the more hospitable table.

Palm-leaf tables

To it the flying-fox resorts and there he makes his meal spread out in comfort, while the fat-bearing seeds, deprived of their coverings, fall unheeded to the ground. Flying-foxes

Man, however, is not heedless of their presence, and, if he owns a grove of *Bassia longifolia*, he plants a Corypha among the Bassias for the benefit of the bats, and sweeps up the seeds in the mornings.

Nay, more. As Sir DAVID PRAIN has put it, "sometimes a man can reason as well as observe." Hence the thought may come to him that there is no need for him to have a grove of Bassia trees. All he needs is a Corypha to furnish a supper-place for flying-foxes carrying the fruit from someone else's Bassias! Hence he plants his palm

FIG. 159.—THE WEST INDIAN CABBAGE PALM (*Oreodoxa oleracea*, MART.)

tree, and in due course reaps his reward at his neighbour's expense. It is an interesting story, connecting the palm with the food of man, and showing how the tree may at one and the same time benefit and injure, albeit inadvertently, the Indian cultivator.

It would be wearisome to recount all the palms which furnish edible fruit, but a few may be cited as examples. The Mucuja of Brazil, an *Acrocomia*, has an apricot-like fruit with a yellow, fatty pulp much prized by the natives. The Tucuma of the same country, an *Astrocaryum*, yields an orange-coloured globe with a sweet taste. The bitter fruit of the Carnauba is eaten by the Indians either raw or boiled, while one of the Palm fruits

Brahea palms of Mexico is named *dulcis* on account of its sweet and cherry-like drupe. A generous tree is the Peach Palm, a species of *Bactris*, for it bears huge clusters, one of which forms a load for a strong man, and each of which is composed of some five-and seventy fruits. They are eaten boiled or roasted, and are said to resemble Spanish chestnuts. The "Corneto" Palm, a species of *Deckeria*, also carries heavy clusters of edible nuts.

As might be expected, the Palmyra, most bountiful of palms, bears an edible fruit, which is eaten roasted, and the pulp of which is preserved and, in the East Indies, is known as Punatoo.

The huge female fruit of the Deleb, though not very appetising, is often a stand-by in time of famine, and one has seen the canoes of the starved and miserable Alur people near Lake Albert piled high with its yellow ovals. When ripe it has a perfume like apricots, and Arabs make a syrup from it.

"Gingerbread Tree"

The thick mealy rind of the fruit of the Doum Palm, *Hyphæne thebaica*, Mart. (Fig. 171), has earned for the latter the name of the "Gingerbread Tree," though few white children would be pleased with it as a substitute for the real article. For all that, it is used as a food-stuff in Egypt and the Sudan, though, of course, it is not to be compared with the date, which is a concentrated form of food-stuff admirably adapted to the needs of the itinerant Arab.

FIG. 170. THE PALM WEEVIL AND GRUB
(From Les Palmeirs utiles et leurs alliés. Grisard and Vanden Berghe)

Much might be said about the date, its different kinds, its composition, its varied uses, but here it is sufficient to refer briefly to the manner in which man does his best to render it insanitary. One has seen the date packers at work in Basra, but the question of the preparation of *'Agwa* is best studied perhaps in Egypt (*see* Figs. 153, 154, 155 and 156, *pages* 180, 181, 182 *and* 183). Women and children, by no means cleanly, usually stone the fruit with their teeth, at least when it is imperfectly ripe—a disgusting procedure—and then the mass of stoned fruit, black with flies, is stamped into a pulp by men. The pulped mass is trodden tightly into palm-leaf baskets and is sold largely for general consumption both in Egypt and to some extent in this country. Indeed, these are the only dates likely to be seen here at the present time, for Mr. DUDGEON informs me that, owing to the fact that a control price of 6*d*. per lb. has been imposed by the Food Ministry, it would not pay to import properly-prepared and carefully-packed dates.

Insanitary date-packing

It is scarcely necessary to mention the Coco-nut. The kernel, when young, is a delicious food, and at a later stage is grated and may be added to puddings or mixed with rice. The dried white outer part of the kernel forms the "copra" of commerce, from which coco-nut oil is expressed, and which is often a constituent of curries or of sweetmeats.

FIG. 171. THE DOUM PALM (*Hyphæne thebaica*, MART.)

FIG. 172.—THE SAGO PALM (*Metroxylon Rumphii*, MART.)

In Zanzibar it is eaten as a spice along with fish, while in the Philippines this so-called meat of the coco-nut is grated, mixed with water and steamed, and then the mass is submitted to pressure, whereby an emulsion of oil, water and cellular tissue is obtained. This cellular tissue is stated by PARKER and BRILL to have a high protein content, and is used by the Filipinos as a food.

Recent experimental work on rats, by JOHNS and his colleagues, in the United States, indicates that commercial coco-nut press cake furnishes the necessary protein for growth *at almost a normal rate. It has been found to contain sufficient* water-soluble vitamine, the dietetic factor in the absence or deficiency of which beri-beri is apt to develop, and some fat-soluble vitamine, the factor which is believed to prevent the occurrence of rickets, or at least of certain forms of malnutrition. The cake appears, however, to be deficient in inorganic constituents, but these, together with animal fat, could easily be supplied from outside sources.

Having mentioned copra, we may diverge for a brief space, for there is a question of hygiene connected with this article. In 1911, CASTELLANI, then in Ceylon, described a very pruriginous form of dermatitis occurring in people handling copra. It was found that certain samples of the latter harboured a species of mite, which was identified as a variety of *Tyroglyphus longior*, Gervais. To the irritation produced by this acarid is to *be attributed the irritating skin affection which attacks the hands, arms and legs, and* sometimes the whole body.[1]

Here, then, we have an occupational disease associated with a palm tree. Man's dealings with copra may also be the cause of a nuisance, for when the nuts are split the milk may, as in Zanzibar, be allowed to flow away and ferment. The result is an offensive sour smell, repugnant to the nostrils of any energetic Medical Officer of Health. It is also interesting to note that copra, if improperly dried, or if it gets wet during the drying process, proves itself an excellent bacterial medium on which all manner of fungi flourish. As the native is not particular in his diet, he often eats both copra and its flora, possibly sometimes with disconcerting effects.

WALKER, in the Philippines, has carried out some interesting investigations on the action of moulds on copra. He has identified amongst the fungi, *Aspergillus catenatus* and *A. flavus*, and he has found that these micro-organisms have the power of splitting up and destroying the oil in the copra, thus spoiling it as a commercial product, and removing the sugar from it. The bacteria present take no part in the fat destruction, but they produce a more or less disagreeable sour odour and cause disintegration of the meat.

It is not only the fruits of palms which serve as food. The familiar sago, an Indian name signifying bread, is obtained from the pith of several species of palm, notably, however, *Metroxylon Rumphii* (*see* Fig. 172, *page* 209) and *M. Sagu*, Mart. The tree is felled, the soft interior is scraped out, pounded and thrown into water. The starch comes away with the water when this is drained off, and it is purified by successive washings. It has been calculated that a tree fifteen years of age will yield from 600 to 700 pounds of sago. The latter is an East Indian product, most of it coming from the Malayan region. The Sago Palm is attractive to the eye, its plume of leaves presenting a fine appearance.

[1] According to FLIPPANCE, of Singapore, cutaneous irritation may also be produced by the juices of certain palm fruits, such as those of the "Kabong" (as the Gomuti is called in Malaya) and the Kitool (*Caryota urens*).

There are several other palms with edible pith, some yielding a product like sago, others a food like farina, while from the thick trunk of *Jubæa spectabilis*, H. B. and K. (*see* Fig. 174, *page* 213), a fine specimen of which adorns the "Temperate House" at Kew Gardens, a syrup is extracted, which goes by the name of palm-honey and is much esteemed in Central Chile. Farina

Indeed, wellnigh every course of a well appointed dinner may be obtained from palm products. A soup, and a very well-flavoured soup, can be prepared by boiling the fruits of *Elæis guineensis*, Jacq. (Fig. 173), the famed West African Oil Palm: meat may perhaps be represented by the young albuminous interior of the coco-nut or by the weevil grub aforementioned. The well-known palm oil chop is not a butcher's product but a kind of A palm dinner

FIG. 173.—OIL PALMS (*Elæis guineensis*, JACQ.).
From a Photograph by Mr. G. DUDGEON

lubricator which helps many a West African dinner on its downward path. As actual butter, we have the oil of *Elæis*[1] or that derived from the closely related "Ma teca," or Butter-Palm, of Equatorial America; pickles are supplied by the heart of the foot-stalk of the West Indian Cabbage Palm (*see* Fig. 158, *page* 196; *also* Fig. 169, *page* 207); vegetables or salads by cabbages from various species, such as *Oreodoxa oleracea*, *Maximiliana Martiana*, Karst., the Inaja or Cocurito of Brazil, the East Indian *Nannorhops Ritchiana*, H. Wendl., or the Gomuti, already mentioned. These "cabbages" are the leaf-buds, and are usually eaten when young and tender. Some of them taste like artichokes. We have seen whence the pudding, be it sago or farina, may come, and how palm-honey can be served with it, while sweetmeats of various kinds, as from the seed of the Arenga or the nut-pulp of the Miriti, are readily forthcoming. Palm cabbages

[1] Now largely used in the manufacture of margarine in the United Kingdom.

Sugar from palms

As for sugar, it is to be had in abundance. The Palmyra yields it in no niggardly fashion, for its juice is rich in saccharine matter, and three quarts of it will make 1 lb. of jaggery. *Phœnix sylvestris*, Roxb., the Date Sugar Palm of India, is also a liberal source of "gur": the Mari Palm, *Caryota urens*, Linn., an Indian tree, furnishes large quantities; and so does *Nipa fruticans*, a swamp palm of the Philippines, which grows half-submerged in water. The Coco-nut Palm is also a sugar yielder, so that our feast will not suffer for want of sweetening.

Vinegar

An agreeable vinegar for the cruet may be got from the Palmyra, the Coco-nut, or the less considered Nipa Palm of the Philippines, merely by allowing their toddies to ferment;

Salt

a salt of a kind is also obtainable from Nipa leaves; and dessert is amply provided by any of the fruits we have described, and may be fresh and succulent like the cherry of the Brahea, or preserved like the dry date, and, preferably, the carefully-treated golden product of Algeria. Here, then, is a feast fit for the gods; and, as will now be apparent, there need be no lack of liquor, spirituous or otherwise, to wash it down.

Drink

Drink.—There are many Toddy Palms, and the important sugar providers are also the chief sources of palm wine, for it is by evaporation of the juice that the jaggery or gur is obtained. It may be the inflorescence which is tapped for toddy, as in the case of

Jaggery

the Coco-nut, the Palmyra, or of *Raphia vinifera*, Beauv., the Bamboo Palm of West Africa; it may be the spadices, as in the Gomuti. The wine may be derived from the leaf spathe or the bark. Sometimes the tree is cut down, holes are bored in its trunk, and in these holes the toddy collects. This is true of the graceful Wine Palm of Para, a species of Mauritia, and the famous "Coyol," *Cocos butyracea*, Linn. f., of Colombia. Indeed, in a good many cases toddy is derived from the stems of palms, and it is interesting to note that the sap may be converted into an inebriating, and hence distinctly unhygienic, lozenge. This is true of Areca sap, while a lozenge is also made from Gomuti toddy. The term "toddy" suggests intoxication, but when drunk early in the morning and fresh from the tree, it is merely a refreshing and agreeable beverage. It is only after fermentation that it develops properties which would now lead to its wholesale condemnation in the United States!

No more healthy, cooling and pleasant drink is obtainable in the Tropics than that yielded by the green coco-nut, about half-a-litre being present in each fruit. This milk has nutritive properties and is really the albumen of the seed in a liquid state. In the Philippines, coco-nut milk is used to a limited extent as a food for native infants. It has been suggested that it may possess considerable nutritional value, and it appears to merit careful investigation. A similar drink can be obtained from the immature nuts of the South American Cohun Palm, a species of Attalea.

Quite another kind of drink is the Brazilian Assai, a creamy, plum-coloured, nut-flavoured liquid manufactured from the sloe-like berries of *Euterpe edulis*, Mart. (Fig. 175). The fruit itself is called Jussára, and its parent is a fine feathery palm with a picturesque plume of leaves. Palm drinks are also prepared from the fruits of other species, and are very nutritious as well as palatable.

Water supply

Water Supply.—Doubtless to many the reading of these two words will suggest the Traveller's Palm and all the stories connected with it. Unhappily for the purposes of this paper, the Traveller's Palm cannot be considered a water reservoir though it be,

Fig. 174.—Jubæa spectabilis, H. B. and K.

Fig. 175 Euterpe edulis, Mart.

for the simple reason that it is not a palm at all, but *Ravenala Madagascarensis*, one of the Musaceæ, and hence a relative of the banana.

It is in rather an indirect manner that certain of the palms are associated with the question of water supply. A common use to which the split stems of some of them are put is that of aqueducts, this being especially the case with the Date Palm, the Palmyra, the long-stemmed Wax Palm of the Andes, *C. andicola*, the Cabbage Palm of the West Indies, and the famous Double Coco-nut Palm of the Seychelles.

SEEMANN mentions that in the sandy parts of Jaffna, in Ceylon, where water is found near the surface and where, owing to strong winds and other causes, the wells are liable to be filled up, a hollowed part of the trunk of a Palmyra is inserted, and forms a well from which the thirsty traveller refreshes himself.

Date-palm wood enters largely into the construction of those native devices for water-lifting, the sakia and shadoof of Egypt and the Sudan, while the Palmyra trunk is also used for fashioning well-sweeps, as the long weighted levers of the shadoofs are called.

Lastly, drinking vessels for holding water are made from palm nuts, and more particularly from those of *Cocos nucifera*, Linn. These, mounted on handles, make a much more sanitary form of "dipper" than a tin or can wielded by a dirty hand.

Mosquitoes.—The very thought of water supply in the Tropics should conjure up visions of mosquitoes, and though the palms rarely constitute themselves nurseries for these insects, as do so many plants in hot and rainy countries, yet they sometimes do act as breeding-places. For example, man comes along and chops steps in the trunk of a Coco-nut Palm. He cares nothing as to their shape so long as they are convenient to his toes. Hence rain-water may collect in the niches, and mosquito larvæ have been found in the miniature pools thus formed.

Mosquitoes

Sometimes also the broad spathe ends of fallen leaves may hold water in which Culicines may oviposit. Again, coco-nut shells, like empty bottles, may collect the rain and form ideal spots for the water stages of Stegomyiæ.

On the whole, however, the palms cannot be reproached for their behaviour where mosquitoes are concerned, and, even where they are apparently at fault, man is usually to blame. It is interesting to note that at Dar-es-Salaam, POMEROY investigated the question of anophelines finding possible breeding-places in Coco-nut Palms and was able to exonerate the latter. It is scarcely the fault of these palms in Barbados and elsewhere that the soil on which they grow, hard by the sea, is beloved of crabs, in the holes of which breeds out that fierce, hæmophilic mosquito *Deinocerites*, which haunts the coco-nut groves. Indeed, it would seem that the palm may actually serve as an anti-mosquito measure, for there is some evidence to show that the Indians in the Orinoco delta swing their hammocks between the tops of lofty Mirití Palms in order to escape the attentions of the blood-sucking gnats. Again, the Borassus and possibly some other palms often harbour bats, than which the mosquito has no deadlier enemy.

Tsetse Flies.—Certain work by YORKE and BLACKLOCK, of the Liverpool School of Tropical Medicine, established a connection between the Oil Palm and *Glossina palpalis*, the tsetse fly which, on the West Coast of Africa is, so far as is known, the sole vector of the trypanosome of human sleeping-sickness.

Tsetse flies

In the course of an investigation into the bionomics of this fly on the Cape Lighthouse Peninsula, Sierra Leone, they discovered that the earth around the trunk of young Oil Palms (*Elæis guineensis*) which had not been stripped of their lower petioles constituted an excellent breeding-place for *Glossina palpalis*.

Furthermore, this tsetse can breed in localities in which the Oil Palm is practically the only tree present.

This is a serious indictment against the young Oil Palm, but happily it is not necessary to cut it down in the flower of its youth, for YORKE and BLACKLOCK found that if the lower petioles are stripped from the palm the ground which they previously sheltered no longer serves as a tsetse nursery.

Still, here is a case where the palm must be regarded as inimical to man, the more so as it has been proved that occasionally the pupa of the tsetse may actually be found amongst the earth and debris which accumulate in the angles formed by the junction of the lower petioles with the trunk.

A series of very excellent photographs illustrates the interesting paper which condemns, though fortunately not irretrievably, the young Oil Palm of the Cape Lighthouse Peninsula.

Washing. The question of water supply also suggests that of washing, and here, once more, we find the palm may play its part, for in Ceylon the dhobies burn the leaves of Coco-nut Palms to obtain alkaline ashes, while I have seen the halves of coco-nuts used as very efficient plank scrubbers during the washing-down of the deck on board one of the steamers on the Victoria Nyanza (*see* Fig. 176, *page* 216). Washing

Vermin.—*A consideration of washing in its turn may, to the hygienist at least, give rise to thoughts of vermin*, and then we find the palms may do a disservice, apart from the question of the copra itch insect, for some of them, and more especially the Palmyra, can and do shelter the plague-carrying rat. *These rodents also may* possibly congregate in large numbers in shambas, where great heaps of coco-nut husks are stored. Vermin

The same is true of snakes, and there is a species of Attalea in Brazil which is said in certain places to be much infested by venomous serpents.

Although perhaps scarcely coming under the heading "Vermin" I cannot refrain from making mention of a point to which Mr. DUDGEON has drawn my attention and which has a bearing on the relationship of *Ardea bubulcus*, the white egret of Egypt, to the Date Palm of that country. This bird usually nests in such trees as the *Acacia Nilotica* and *Ficus sycomorus*, but, as those trees have been largely cut down for fuel in Upper Egypt, it has taken to making its home in the Date Palms, much to the annoyance of the owners of the latter, who have tried to obtain an injunction against it, but happily in vain. At first sight it is not easy to see what this has to do with hygiene, for none but the irate owners of the Date Palms are likely to class the beautiful and useful egret as vermin. When, however, the food of the bird is considered, its possible connection with sanitary matters is apparent, for, in all probability, the white egret destroys large numbers of those fresh-water snails which have now been shown to be the intermediate host of the human schistosomes. The Date Palm forming its habitation is thus, remotely it is true, again brought into hygienic association with man. Egret and Date Palm

We have discussed the more important sanitary relationships of the palms to man, but there are many other ways in which these wonderful trees, or at least, their products, acquire a hygienic significance. They may be considered briefly under the heading—

Personal hygiene

Personal Hygiene.—A humble but useful sanitary utensil is the broom, and into its construction there enters very largely the fibre known as "Piassava." This is derived from the elastic, resistant portions of the leaf bases which form a sheath round the palm trunk. It is named according to the part of the world from which it comes.

FIG. 176.—SCRUBBING DECKS WITH COCO-NUT SHELLS

Piassava

Thus there is Bahia Piassava, from the Brazilian Palm, *Attalea funifera* (Fig. 177), the Para variety, also from Brazil, but the product of a Leopoldinia; the West African article from *Raphia vinifera* or *R. Hookeri*, G. Mann and H. Wendl; and the Madagascar Piassava, from the "Vonitra" Palm, *Dictyosperma fibrosum*, C. H. Wright.

The fibres of many other palms are used locally; in Panama, for example, those of a species of Thrinax figuring in the local brooms. Brushes stand in close relationship to brooms, and in some cases their bristles are also derived from palms; while fans and punkahs, both closely associated with personal hygiene, may be the product of palm leaves.

Fig. 177.—Attalea funifera, Mart.

Fig. 178.—Areca catechu, Linn.

Baskets

Baskets, at least when used for storing and carrying food, thus protecting it from dust and flies, are distinctly articles of hygienic interest. The Date Palm, the Palmyra and many others furnish material for basket-work, but there is one palm in South America, *M. Martiana* Karst., which supplies a basket ready made in the form of its roomy spathe.

One of the most elegant of palms is the *Areca catechu*, Linn. (*see* Fig. 178, *page 217*), or Betel-nut Tree.

Betel-nut tree

The nut is used along with the Betel leaf of a pepper vine as a masticatory, and, though it is said to preserve the teeth, it blackens them, while the manner in which confirmed betel chewers spit forth a red saliva can only be considered as a very disagreeable and insanitary performance. The areca nut is, however, grated to form a dentifrice, and areca-nut charcoal used to enter into the composition of tooth powders. Drinking and baking utensils are made from the spathes, so that the Areca Palm is distinctly a subject for a sanitary sermon on a small scale.

Dentifrices

The so-called Dragon's Blood obtained from the fruit of *Dæmonorops draco*, Blume, a native of Sumatra and the Malay Islands, has also been used in dentifrices, and hence deserves passing notice.

Combs

Combs must be considered as having some sanitary significance. The small tooth comb, at least, is far from being negligible in this respect, and here again the Coco-nut tree is to the fore, for the South Sea Islanders construct combs from its leaves. Presumably,

Shaving dishes

even the shaving dish comes into our category, and very beautiful ones, black and polished, are fashioned from the nuts of the famous Seychelle Palm, the Coco-de-mer which has already been mentioned (Fig. 179). Such a utensil

Soap

naturally suggests soap, and once more the palm supplies the wherewithal for its manufacture.

FIG. 179.—THE COCO-DE-MER (*Lodoicea Seychellarum*, LABILL.)

Umbrellas

Indeed, there would seem no end to the subject, for does not the homely umbrella play a part in personal hygiene, and do not its ribs, in certain places at least, come from palms as, for example, the Talipot tree of Ceylon, *Corypha umbraculifera*, Linn., and at least one species of *Calamus*?

Who can say in how many directions the oils and waxes derived from palms come into touch with man's sanitary needs, more especially in countries where life is still primitive and where he is more directly in touch with Nature? Oils and waxes

We may, however, mention that coco-nut oil is largely used in the East for dressing the hair, and, indeed, is wellnigh an indispensable item in the toilet of an Indian belle.

It would be easy to enlarge our subject, to consider questions of fuel and cooking in relation to the palms, to extend our observation to the possibilities of the inflorescence of such palms as the Sago and the Date producing hay fever at certain times of the year, even to discuss the sanitary significance of certain scents obtainable from the flowers of palms: but such excursions are unnecessary.

Enough has been said to indicate how beneficent and widespread is the role of the palm in serving man, how closely its products are concerned with his hygiene, his well-being and his comfort, and how well fitted it is to be made the subject of a text, more so indeed than the lily of the field, for, while the lily has little besides its beauty and its fragrance to commend it, the palm is indeed, in the words of the Indian of the forest, "a Tree of Life." "A Tree of Life"

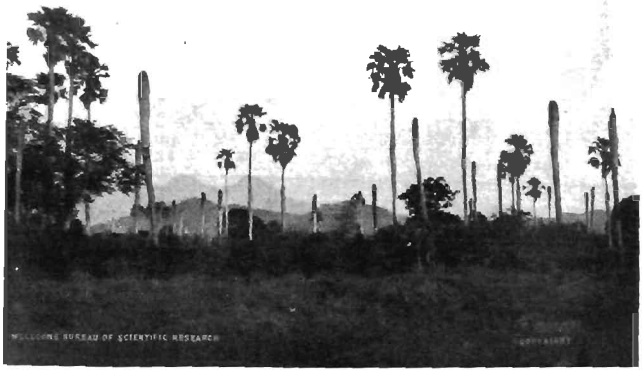


FIG. 180.—HEADLESS BORASSUS PALMS

The palms have died as the result of the cabbages having been cut out for use as food