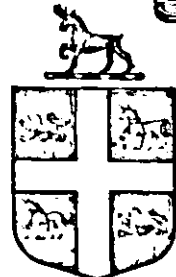
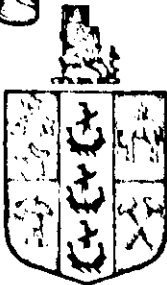


THE
BRITISH EMPIRE
 A Survey in 12 Volumes—each self-contained
Edited by
HUGH GUNN



INTRODUCTION TO THE SERIES

A WORD is necessary as to the origin and object of this series. The Management of the British Empire Exhibition (1924), in the early days of its organisation, approached the Imperial Studies Committee of the Royal Colonial Institute for advice and assistance in connection with the educational aspect of the Exhibition's work. The Editor of this series, who is a member of that Committee, happened during a period of enforced leisure to be spending a good deal of his time at the Institute, chiefly in its delightful Library. On its shelves he found entrancing reminiscences or records of men who went forth from these islands as Pioneers to brave the perils of uncharted seas and the dangers of unknown lands, inspired more by the spirit of adventure inherent in the race than by any calculated design for personal gain or lust for the acquisition of new territories. From these volumes could be traced the beginnings and gradual growth of remote colonies, through the early stages of awakening public interest, followed perchance by apathy or neglect until the advent of some world movement brought them into the fierce light of economic and international importance.

Though there lay upon the shelves an immense mass of valuable literature on almost every phase of Imperial work, it became apparent to the Editor that there was no series of volumes which gave a complete survey of the history, resources, and activities of the Empire looked at as a whole. He felt that there was need for a

series which would provide the ordinary reader with a bird's-eye view, so to speak, of these manifold activities.

The time seemed appropriate for such a survey. The Empire had emerged victorious from the greatest of wars. The Dominions which had contributed so magnificently to the victory had sprung, as it were, at a bound not only into the consciousness and acknowledged status of full and equal nationhood with the Mother Country, but also into definite recognition by Foreign Powers as great and growing World-Forces.

The decision to hold in London an Exhibition in which the vast material resources and industries of the Empire would be brought vividly before the public seemed also to demand that there should be a record and survey of the growth and development of this far-flung congeries of countries and peoples that are called the British Commonwealth of Nations.

The Editor accordingly consulted some of his friends, and was fortunate in securing their assistance and advice. The Management of the British Empire Exhibition welcomed the scheme as supplementing from the intellectual side what the Exhibition was doing from the material aspect. He has also been fortunate in obtaining the co-operation, as authors, of distinguished men, many of whom have played a foremost part in the public life or administration of the territories concerned, and all of whom have had wide personal knowledge and experience of the subjects which they treat. The Editor's thanks are especially due to these authors. They have undertaken the work from a sense of duty and from a desire to provide, at an important stage in our history, authoritative information regarding the great heritage that has been bequeathed to us, not only unscathed

Introduction to the Series

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but strengthened by the stern struggle through which it has passed.

Each volume is self-contained and deals with a special aspect of the Empire treated as a whole. The volumes are, however, co-ordinated as far as possible, and give, it is hoped, a comprehensive survey of the Empire.

The writers have had complete freedom as regards the statement of their views, and it is to be understood that neither the Editor nor his advisers are responsible for such individual expressions of opinion.

The late Sir George Parkin was deeply interested in the scheme, and, but for his lamented death, would have contributed a volume to the series.

The Editor, in conclusion, desires to express his thanks to Lord Morris, and to Sir Charles Lucas, especially the latter, for the benefit of their advice and ripe experience.

HUGH GUNN,
General Editor.

LONDON, *April, 1924.*

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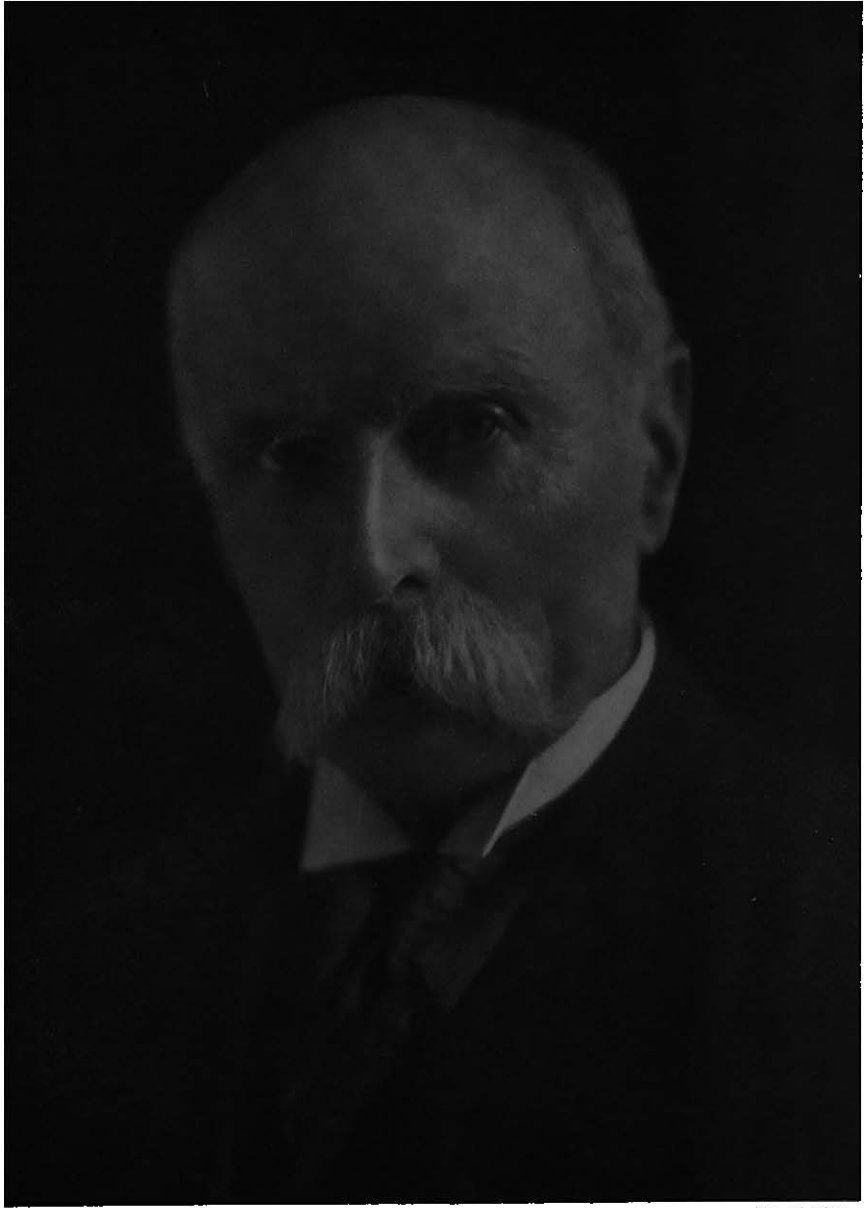
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THE LATE SIR GEORGE R. PARKIN, K.C.M.G., LL.D.

Late Secretary of the Rhodes Trust, who gave valuable assistance until his death.

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- V. HEALTH PROBLEMS OF THE EMPIRE—PAST, PRESENT, AND FUTURE**
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Major E. A. Belcher.

**HEALTH PROBLEMS
OF THE EMPIRE**



Frontispiece

Professor Sir William J. R. Simpson, C.M.G., M.D., F.R.C.P.
A Pioneer in Imperial Hygiene.

HEALTH PROBLEMS OF THE EMPIRE

PAST, PRESENT AND FUTURE

by

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FOUR NOTABLE DICTA

" A great scholar and a great wit three hundred years ago said that in his opinion there was a great mistake in the Vulgate, which, as you all know, is the Latin translation of the Holy Scriptures ; and that instead of saying ' Vanity of vanities, all is vanity '—' *Vanitas vanitatum, omnia vanitas* '—the wise and witty king really said : ' *Sanitas sanitatum, omnia sanitas.* ' Gentlemen, it is impossible to overrate the importance of the subject. After all, the first consideration of a minister should be the health of the people. A land may be covered with historic trophies, with museums of Science and galleries of Art, with Universities and with Libraries ; the people may be civilised and ingenious ; the country may be even famous in the annals of action of the world ; but, gentlemen, if the population every ten years decreases, and the stature of the race every ten years diminishes, the history of that country will soon be the history of the past."—DISRAELI.

" The great work of sanitary reforms has been, perhaps, the noblest legislative achievement of our age, and if measured by the suffering it has diminished, has probably done far more for the real happiness of mankind than all the many questions that make and unmake ministries."—LECKY.

" Public health education is the power that keeps in motion the machinery of sanitation."—SISCO.

" The practice of preventive medicine in its modern meaning rests upon the growth of medical science and the application of that knowledge to the problems of disease."—NEWMAN.

PREFACE

WHEN asked to undertake the preparation of a work dealing with Public Health in its relation to the British Commonwealth as a whole, we hesitated to comply with the invitation. In fact at first we declined it, for it seemed to us that a large library and not a single small book would be required for the adequate presentation of such a subject. It was at once evident that, unless treated historically, a convincing story could not be submitted to those for whom the work was intended, and the history, even the public health history, of a large part of the world for several hundred years cannot easily be compressed into a few pages. Again, the Empire is so vast and its public health interests are so huge, so complex and so important that we wellnigh despaired of being able to give any true conception of the part which hygiene, using the word in its broadest sense, has played and is playing throughout the Commonwealth. On the other hand, we felt that the effort should be made. A precisely similar task has not hitherto been attempted. Fremantle's interesting and useful *Health and Empire* is a traveller's study, and is only in part concerned with British territories. Moreover, it deals in the main merely with certain aspects of public health work though its short concluding chapter is of a more general nature. Newsholme's valuable *Public Health and Insurance* is concerned with home conditions. The whole subject possesses great fascination for those who, like ourselves, have been brought intimately into contact with public health problems in many parts of the world. There is an element of romance in sanitation, and there is no reason why the theme should not be made interesting to the lay reader. War, whatever else it may be, is rarely dull, and the practice of hygiene spells war; ceaseless, relentless, and, if well and truly waged, victorious war against deadly foes—the enemies of all mankind. The conquest of disease is an enthralling business which might appeal to every one with a soul and an imagination if only it were explained in fitting terms.

Again, the care of the public health is from every point

of view a vital factor in the welfare of the Empire. Slowly, far too slowly in some places, this is being recognised, but there is still a great need for education even among enlightened white communities, while many who are convinced of the value of hygienic measures have no idea how they originated, how they have developed, or what machinery is necessary for their proper prosecution.

Accordingly we agreed to undertake the work. The liberality of the editor in granting us more space than that originally allotted rescued us from a feeling of hopelessness which at one time threatened to overwhelm us, for the magnitude of the subject came as a revelation, familiar though we were with many of its features. Even so we are only too conscious of deficiencies and defects. It has been difficult to obtain certain information, it has been impossible to incorporate much that was available, it has been necessary to curtail and yet strive to avoid producing a lifeless narrative.

The book, such as it is, makes no pretension to being a scientific treatise in the strict sense of the word. Yet it deals with scientific matters, and we hope possesses the accuracy and clarity which Science demands. At the best it is merely a sketch, a bird's-eye view of a great drama, an outline of public health history in its relation to the British Empire. It is intended more to evoke interest in the subject and to stimulate research than to furnish facts and figures. Indeed we have for the most part carefully avoided statistics. They appeal to few, and, so far as tropical countries are concerned, many of them possess little value, for they are notoriously inaccurate.

There has been no opportunity of rendering homage to many who have fought the good fight, and it has not been feasible to give details of much that is of great interest and importance in the case of many lands. Certain parts of the Empire have had to be altogether ignored, as, for example, the little island of Malta. It is a tiny spot on the map, but it looms large in the history of preventive medicine owing to its association with Undulant Fever. To this merely a passing reference is made. Port sanitary work is a great and imperial form of activity which assuredly deserves a lengthy chapter to itself, as does Industrial Hygiene, but we have only been able to accord them brief mention here and there.

A huge mass of most valuable material remains for the exploitation of those who have the courage to handle it.

If this small volume serves them, in some measure, as a reliable guide, it will not have been penned in vain, and for this reason a considerable, if limited, bibliography is appended, though it contains references only to books, not to papers published in journals or to the manifold reports which have been consulted.

Yet though we feel it incumbent upon us to offer certain apologies, we have not lacked much kind assistance and encouragement in our task. To the Council of the Royal Colonial Institute we are indebted for permission to make use of the library there, and we are specially grateful to Mr. Evans Lewin, M.B.E., for the skilled help he has given us. His unrivalled knowledge of what may be called colonial literature has been placed fully and freely at our disposal. Other librarians who have been good enough to render us material aid are Mr. W. Scott, late of the Colonial Office Library, Mr. D. Halkett, the librarian of the Royal Army Medical College, Mr. H. E. Powell, the custodian of the library of the Royal Society of Medicine, Mr. D. Woodrow, assistant librarian, Royal Geographical Society, and Miss J. M. Bellis, librarian of the Wellcome Bureau of Scientific Research.

Sir William Simpson, C.M.G., and Colonel W. G. King, C.S.I., I.M.S. (ret.) have most kindly furnished us with literature relating to India, and given us the benefit of their wide experience in connection with that country. Sir William Simpson has also advised us with regard to several other British possessions.

Professor T. A. Starkey of the McGill University, Montreal, went to considerable trouble on our behalf and sent us useful notes from Canada, regarding which we also received important information from Professor FitzGerald, Dr. Charles Hastings and Dr. Fleming of Toronto. Dr. J. A. Mitchell furnished us with references to public health work in the Union of South Africa, and Sir James Allen, K.C.B., most kindly collected and sent to us a number of valuable documents relating to New Zealand.

Other names we would particularly like to mention are those of Sir Arthur Newsholme, K.C.B., Colonel P. G. Stock, C.B., C.B.E., of the Ministry of Health, Lt.-Col. E. D. W. Greig, C.I.E., of the Indian Medical Service, Dr. A. E. Horn, C.M.G., and Mr. H. R. Cowell of the Colonial Office, Dr. O. F. H. Atkey, the Director of the Sudan Medical Department, Dr. J. L. Gilks, the Principal Medical Officer of Kenya

Colony, Major G. J. Keane, D.S.O., who has charge of the venereal diseases campaign in Uganda, Dr. F. McCallum of the Australian Health Department, and Mr. C. J. S. Thompson of the Wellcome Historical Medical Museum.

In the actual preparation of the book, Lt.-Col. G. E. F. Stammers, O.B.E., Mr. H. K. M. Troy, Secretary to the Wellcome Bureau of Scientific Research, and Miss Susan Smith have helped us very greatly, and we would tender them our sincere thanks.

A. B.
H. H. S.

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PART I

THE EVOLUTION OF A HEALTH CONSCIENCE

INTRODUCTION

It is not altogether easy to say at what precise time in the world's history the foundations of the British Empire were laid. The accurate historian would probably point to the establishment of the colony of Virginia in 1607, as it was the first settlement which proved in any degree permanent. It is true Newfoundland was occupied in 1583, but it was afterwards abandoned, though it still claims priority as the first of England's overseas possessions. There can, however, be little doubt that the spacious days of the great Elizabeth really witnessed that sowing of the seed which has resulted in the mighty tree of the present day, and a consideration of the part which hygiene played in the stirring saga of the sea, and later in the new lands beyond the Atlantic, reveals the efforts made by seafarers and settlers to cope with sanitary problems under difficult or novel conditions.

Everything was, of course, primitive, but the very simplicity of the arrangements tended towards safety. This was specially true at sea. In the tiny vessels which in those days threaded the ocean men slept for the most part in the open, at least so soon as their ships had gained warm latitudes. They "pricked for the softest planks," and, save when the weather was bad and they had to be battened down under closed hatches, they breathed a pure air and there was little congestion and overcrowding, even though the tiny craft were, as the old phrase runs, "alive with men."

Conservancy questions scarcely troubled them. The sea, vast and salt, received their refuse. The vessels were, for the most part, bachelor establishments. There was little thought of decency in those rough times, and the bows of the galleons were so fashioned that they served as excellent conveniences, permitting usually a clean drop to the briny, while if any fouling did occur the cleansing sweep of waves soon made amends. Speaking generally, hygienic problems, apart from outbreaks of epidemic disease such as yellow

fever and plague, resolved themselves into questions concerned with food and drink. The old records give forth no uncertain sound on this matter. It is the weevily biscuit and the stinking water in the cask that cause trouble and turn the stout stomachs of the naval pioneers. It is the lack of green stuff which breeds the scurvy. It is the monotony of the diet which produces illness and at times mutiny.

So far as food is concerned, the men who voyaged with Drake and Raleigh were unable, from lack of scientific knowledge, to adopt precautionary measures of much value. The art of preserving meat, save by pickling, smoking, and exposure to the sun, had not been developed. Vegetables could not be kept in anything approaching a fresh condition for any length of time. There was inevitably a great lack of vitamins in the dietary of the sailor and gentleman-adventurer.

The craving for variety, the need for supplying food deficiencies, was shown by the foraging for scurvy grass, by the way in which, whenever ships made the land, there was an eager search for fruits and vegetables and fresh meat. It was exemplified further by the manner in which at a later date the buccaneers and other explorers turned fowls and pigs adrift upon islands they were likely to revisit.

The marvel is that on such commons so much should have been accomplished; but it was only the careful and experienced leader, who made the most of the measures available, that was likely to carry a venture to a successful conclusion. Such a man was the bold Sir Richard Hawkins. It is interesting to note that, so early as 1593, he knew how to replenish his water-casks by a scientific method, for in his "observations" upon the voyage of his ship, the *Dainty*, to the South Seas, he says:—

"In the passage to Brazil our fresh water had failed us many days by reason of our long navigation, yet with an invention I had in my ship I easily drew out of the water of the sea sufficient quantity of fresh water to sustain my people with little expense of fuel; for with four billets I stilled a hoghead of water and therewith dressed meats for the sick and hale. The water so distilled was found to be wholesome and nourishing."

Yet to Lind, the naval surgeon, who flourished in the eighteenth century, is attributed the discovery that fresh water can be distilled from salt.

Lind himself deals with the question of priority of discovery in the Appendix to his *Essay on Diseases incidental to Europeans in Hot Climates*, and mentions the claims of Sir Richard Hawkins as having practised a method known to the ancients and referred to by Lord Verulam. He does not, however, make good his case against the stout Elizabethan seaman, who appears to have distilled sea water without the addition of any chemical substances. Everything seems to turn on what is meant, in quantity, by a billet of wood.

On shore the early settlers lived under primitive conditions, but, after all, these did not greatly differ, so far as sanitation is concerned, from those they had quitted in England. Indeed, if the settler had formerly inhabited an English town of any size, he found that he had benefited by the change, for the sanitary arrangements of those days in London and other centres of population were not only crude but dangerous. Only the fortunate, the hardy, or those who, owing to mild attacks of disease or the frequent absorption of small doses of virus, had acquired immunity, survived the perils to which they were exposed. The infant mortality was huge, the death-rate high, the expectation of life exceedingly uncertain. It was an age of filth, of public and personal filth. Water supplies, as a rule easily secured by the comparatively small community, were as easily fouled. The houses were often dirty, the streets, as a rule, woefully unclean. So far as London is concerned, the town was for the most part a mere huddle of dwellings, overcrowding was rife, and determined efforts had been made thus early to exclude sun, and light, and air. Vermin of all kinds abounded, and the habit of personal bathing, beloved by the Greek and the Roman, even the Roman colonist in Britain, was practically unknown. Hence the use of scents and perfumes, of pomanders and vinaigrettes. It was a foul age, if a brave age, and the Great Fire of London had not yet come as a purifying agent and an incentive to better things.

Even so, however, there was a little leaven of hygiene in what was to become the heart of the Empire.

Away back in 1287, a law had been passed for London making every householder responsible for cleaning the street in front of his own premises. Thereby some good and much evil was accomplished, for those who had no land wherein to bury refuse and excreta, and who, owing to the houses being built of wood and to the lack of fuel, dared not burn it, found the Thames, then a comparatively small stream, a

useful cloaca. Into it was thrown all the dung and garbage until it was in danger of being blocked, a state of things which gave rise to a royal complaint, for the king, Edward III., drew the attention of the mayor and sheriffs to the nuisance and danger. As a result, a law was enacted forbidding the fouling of the Thames or the Fleet or the ditches round the city walls, and enjoining the removal of rubbish by carts to spots outside the city. As, however, no communal action was taken, it is not surprising that the practice persisted, and that in 1372 the king had again to interfere and threaten pains and penalties if his wishes continued to be disregarded.

By the reign of Richard II. the state of latrines and other noxious places had become so bad that legislation was again put in force so far as the condition of cities and towns and their immediate surroundings was concerned. Of greater significance from the point of view of the future Empire was the Act of Parliament passed in 1532 which led to the establishment of Commissions of Sewers. At first sight it may be difficult to see what intimate connections exist between sewers and the development of the British Empire, but the question assumes a different complexion when it is stated that these early sewers were for the drainage of land only. Their introduction wrought a radical change. A great part of England consisted of swamps and marshes, and in these waterlogged stretches there bred out species of anopheline mosquitoes, some of which at least still persist and which, in those days, were the vectors of ague. Malaria, indeed, was rife in the land, both then and at a much later date, and Defoe, writing about a century after the time we are considering, speaks of the low-lying stretches about the Thames estuary, where, he tells us, seasoned inhabitants of the district were wont to supply themselves with wives from the uplands. These rarely lasted more than one year, so that it was not uncommon for a man to have from five or six to fourteen or fifteen helpmeets! It is a grievous picture of what was called "Merrie England"; London in some respects a death-trap, the few considerable towns dirty and disease-ridden, many of the rural districts fever-stricken and pestilential. Yet the people were used to it all and joggled along unaware that matters could be improved, thankful, especially the women, if they escaped the disfiguring effects of small-pox, considering themselves lucky if they did not fall victims to a calenture, and possibly surprised if they succeeded in reaching a ripe old age.

Those open, graded ditches, the sewers, changed the face of the land. It was reclaimed for agriculture, and as the fields and enclosures multiplied so did the mosquitoes and malaria diminish, while other febrile conditions and the crippling rheumatism, so great a feature of the Middle Ages, lessened in incidence and intensity.

It was, however, long before the lessons learned at home were applied abroad. As a matter of fact, in such an early colony as Virginia they were scarcely required. The settlers were few, the lands spacious, and malaria was at first not much in evidence. The original inhabitants were in many cases nomads, and came but little into close contact with the white man, partly owing to their habits and customs, partly on account of hostility to the newcomers. Moreover, the Red Indians were in the main a healthy people, and from the hygienic point of view were much less a danger to the colonists than the latter were to them. There can be little doubt that it was the advent of the negro slave which rendered a simple problem complex, and it is essential to consider in some measure the influence of the slave traffic on colonial sanitation. Before doing so, however, it is well to cite an example where the local conditions themselves, with but few extraneous circumstances, sufficed not merely to jeopardise but to ruin irretrievably a colony in the making. A classical instance is to be found in the ill-fated Scottish expedition of the Darien, the first part of which landed on a pestiferous spot of land in 1698, and which, though well found in ships, money, and men, came to grief mainly, if not wholly, by reason of disease, the ravages of which were to some extent aggravated by alcoholic excess. A graphic account of the disaster, which occasioned much tribulation and recrimination throughout the Scottish lowlands, is given in the *Memoirs* of the Rev. Francis Borland, who was one of the chaplains to the second portion of the expedition, and who published his little book in 1700. It is well and judiciously written, wonderfully informative, suggestive, and sagacious, and, judging from inference, leaves one in no doubt that mosquito-borne fevers wrecked the enterprise.

Indeed the reverend gentleman states that "Here are also a great many troublesome insects, especially the country is full of ants, wood-lice, and musketas, and which are common through the West Indies." The settlers did not appear to suffer from scarcity of food or, save when besieged, from a lack of anti-scorbutic vitamins

though, it is true, there had been some nefarious tinkering with provisions.

The fish are said to be "sweeter and fatter than ours at home," and oranges were available. The fort, however, was built "close to wet, marish ground in the rainy season," and the author comments on the stillness and calmness of the air during that period of the year and the "sulphurous damp and vapours arising from the marish and drowned ground."

There were Indians in the vicinity who were sickly in the rains, and the Spaniards who attacked the Scottish colonists and eventually occupied their territory suffered grievously from illness and death.

Borland, evidently a well-read man, quotes from previous writers, Peter Martyr, Ogilvie, and Collier, to show that the fatal neck of land possessed an unenviable reputation for unhealthiness, and says:—

"Some may question whether this place of the Scots Settlement be a healthy country, yea or not, so that an European Colony could thrive in it upon this score.

"In answer whereunto it may be remarked—

"1. That our Countrymen who went thither first to settle, though for some time after their arrival there they were pretty healthy, yet afterwards proved very sickly, and many of them died.

"2. Our People who went thither about a year after were generally very sickly through the whole time of their abode there, and it proved a grave to many of them, and that even in the dry and healthiest time of the year."

Other interesting details are given, as, for example, the occurrence of fluxes (dysentery) amongst the remnant of survivors, due in all probability to a polluted water supply during the period of investment by the Spaniards. Our author concludes this section of his jeremiad as follows:—

"So that it seems it may be said of Darien: Thou Land devourest Men and eatest up thy inhabitants. No wonder then that our Colonie neither did, nor could thrive there, suppose no other enemy in the World [he refers to the Spaniards and the jealousy of the English merchants] had molested them."

At the end of the *Memoirs* there is printed this mournful attempt at verse:—

"No wonder then, our Infant Colony
In Darien could not long Time thriving be,
By such ill Neighbours, in a Spot of Earth
Beset with Grievs and daily Views of Death
Remote from Friends, with Objects of Envy
To many, who did wish we here might die.
Our single Strength, but feeble to support us,
Our skill in such affairs, small to direct us,
Besides an higher cause of our Distresses
God's wrath against us for our great Trespasses
Then strange not that our new Plantation
Soon died and came to Desolation."

The line, "Our skill in such affairs, small to direct us," is most significant. Two hundred years later a similar want of skill, due chiefly to lack of knowledge, occasioned, not far from Darien, a similar melancholy tragedy when the French failed in their great endeavour at Panama. It was left to the Americans, the heirs to learning, gained partly by others, partly by themselves, to triumph over malign local conditions, so that had they so desired they might with truth have exclaimed, as did Sir Ronald Ross in his poem on the solution of the problem of malaria transmission:—

"O Death, where is thy sting?
Thy victory, O Grave?"

At the time when the earliest settlements were formed in America and in such West Indian islands as Barbados and St. Christopher, the embryo Empire had few footings elsewhere, and even those which did exist were merely of the nature of isolated trading posts, such as that of Gombrun on the Persian Gulf and Surat in India. From a public health point of view there is nothing to be learned from a study of the history of such places, save perhaps that the habit of heavy drinking which was by no means uncommon amongst the English emissaries of those days, militated against success and played havoc with the liver.

To return, then, to the part taken by the slave trade in introducing disease into the New World colonies, it should be noted that the slaves themselves were first obtained from the Dutch who had settled on the Gold Coast.

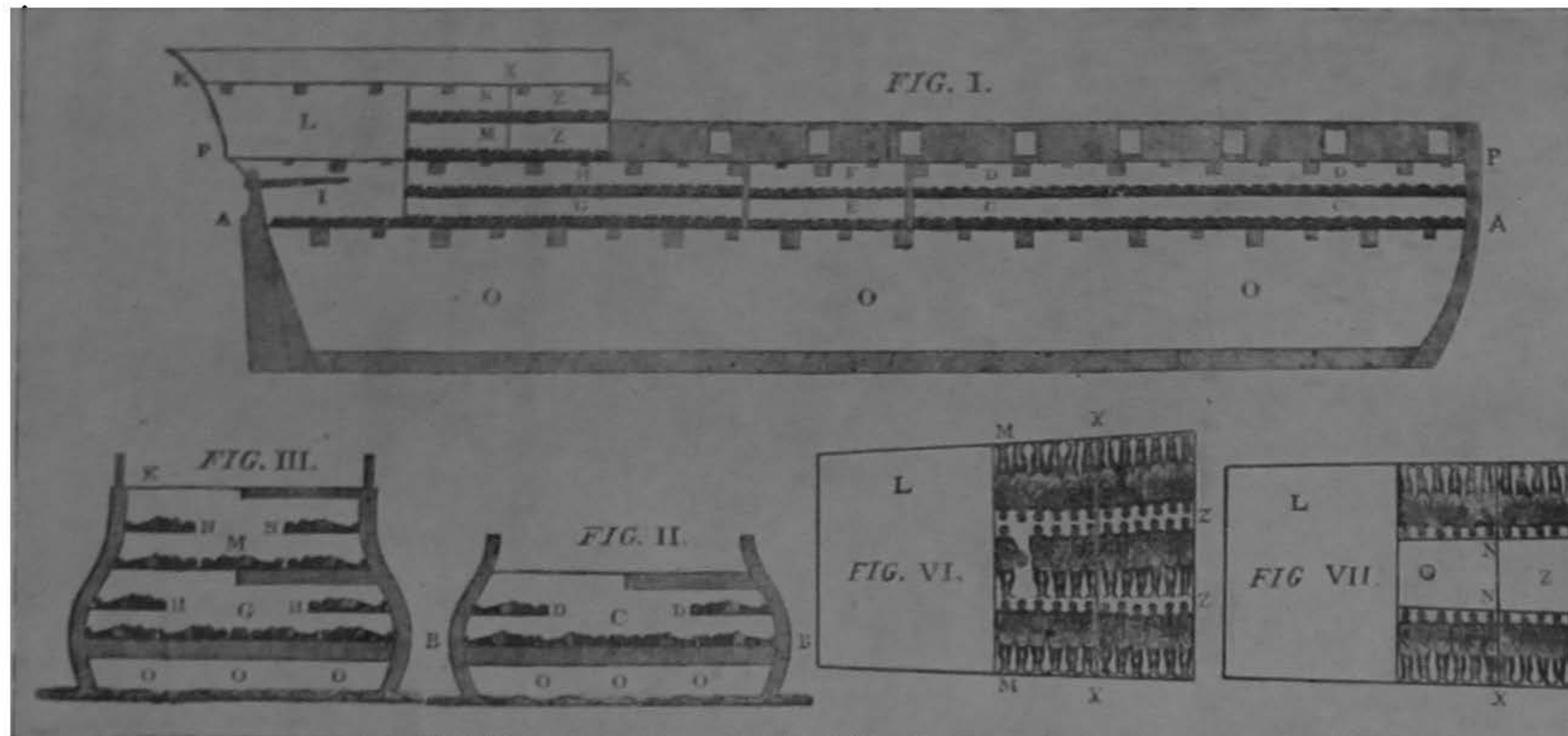
Some care was taken to select apparently healthy negroes and negresses for shipment, as we know from the records of Phillips, but in the light of our knowledge of so-called healthy

disease "carriers," it is clear that a mere physical examination was not sufficient to exclude individuals harbouring pathogenic organisms, as, for example, the entamoeba of dysentery. The captives, mentally depressed and often weary after the long and trying journey by caravan from the interior, were crowded on board small vessels and confined under appalling sanitary conditions. It is no wonder that epidemics broke out on board ships engaged in the iniquitous "black ivory" traffic, and that the slaves were sometimes the means of starting outbreaks of disease in the new countries wherein such of them as survived the horrors of the passage were landed. In addition to the part they played in disseminating dysentery, pneumonia, leprosy, and other maladies, the slaves from Africa were in all probability the introducers of certain species of intestinal worms. One can only guess at their rôle in this direction, but it is conceivable that one or both species of human ancylostome may have gained a footing in Virginia and the West Indies through their agency.

It is of some interest to note that Towne in his treatise on West Indian diseases published in 1726 makes a special reference to the frequency of dropsy amongst the blacks, and it is possible that these cases were examples of the severer forms of ancylostomiasis. But speculation of this kind, however interesting, is not very profitable, and it only remains to say that if the tide of disease set in the first place towards the west, there was almost certainly a return flow, and that the African West Coast, like the new countries on the other side of the Atlantic, suffered from the hygienic point of view as the result of the inter-communication consequent upon the traffic in slaves. For example, the balance of evidence is undoubtedly in favour of the view that yellow fever reached Africa from the West Indies and countries bordering on the Gulf of Mexico.¹

Any who wish to study the matter in all its ghastly details, and realise that whatever wrongs the slaves unwittingly perpetrated in the way of introducing disease were as nothing to those they suffered at the hands of brutes in human guise, cannot do better than consult the small volume published in 1791, containing "An Abstract of the Evidence delivered before a Select Committee of the House of Commons

¹ Recent investigations by the well-known authority on yellow fever, Dr. H. K. Carter of the American Health Service, have, however, led him to the belief that the reverse was the case. (Personal communication).



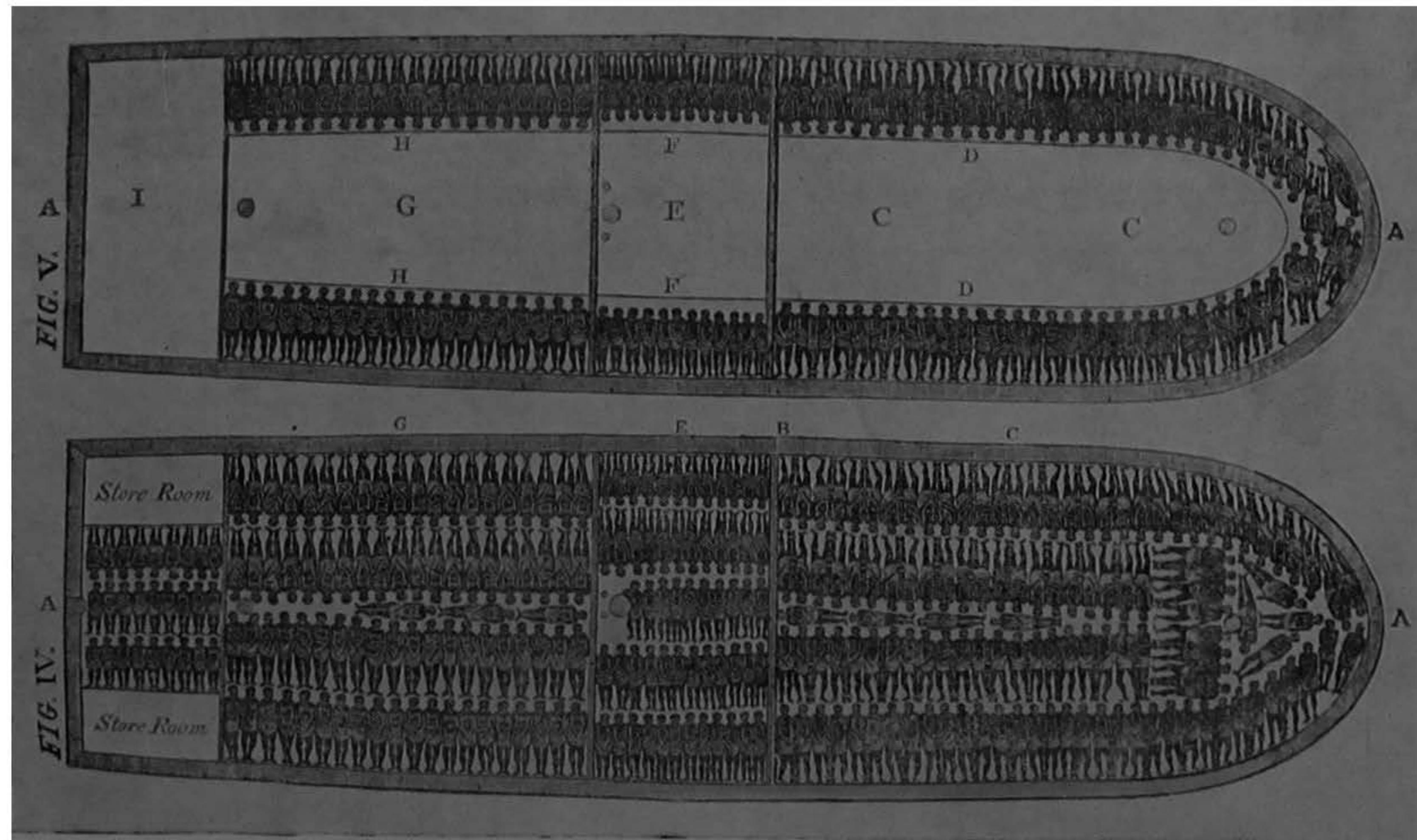
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Method of stowing slaves on board the ship *Brookes*. Plan of Captain Perry.

A. A. Lower Deck
 B. B. Breadth of Beam on Lower Deck
 C. C. Men's Room on Lower Deck
 D. D. Platforms in Men's Room
 E. E. Boys' Room

F. F. Platforms in Boys' Room
 G. G. Women's Room
 H. H. Platforms in Women's Room
 I. I. Gun Room on Lower Deck
 K. K. Quarter Deck
 L. L. Cabin

M. M. Half Deck
 N. N. Platforms on Half Deck
 O. O. O. Hold
 P. P. Upper Deck
 Z. Z. Extra Stowage for Women



To face page 9

Method of stowing slaves on board the ship *Brookes*. Plan of Captain Perry.

- | | | | | | |
|-------|-------------------------------|-------|---------------------------|----------|-------------------------|
| A. A. | Lower Deck | F. F. | Platforms in Boys' Room | M. M. | Half Deck |
| B. B. | Breadth of Beam on Lower Deck | G. G. | Women's Room | N. N. | Platforms on Half Deck |
| C. C. | Men's Room on Lower Deck | H. H. | Platforms in Women's Room | O. O. O. | Hold |
| D. D. | Platforms in Men's Room | I. I. | Gun Room on Lower Deck | P. P. | Upper Deck |
| E. E. | Boys' Room | K. K. | Quarter Deck | Z. | Extra Stowage for Women |
| | | L. L. | Cul in | | |

in the years 1790 and 1791 on the part of the Petitioners for the Abolition of the Slave Trade." Here one need merely cite, from the point of view of overcrowding, the case of the ship *Brookes*, a vessel of only 320 tons which, even though a regulating act had lately been passed, was permitted to convey 454 unfortunate people, whose method of stowage is graphically shown in the queer plans of Captain Perry. The heavy mortality amongst seamen manning slavers is a point of interest which is brought out in the evidence.

The slave trade, so far as England is concerned, appears to have been started by Captain (afterwards Sir John) Hawkins, in 1562, though it was not until a considerably later date that shiploads of slaves were conveyed to English colonies.

It lasted until 1807, but its hygienic influence has persisted to the present day, and, while it served to develop many British possessions, it played a notable part in rendering them unhealthy, and has proved the direct cause of many of the problems which, in the case of the West Indies at least, confront the hygienist.

At a later date Indian and Chinese immigration also exercised a profound effect on sanitary questions, but, as this was not confined to colonies in the New World, its consideration may be deferred until we have briefly reviewed the advances made in the care of the public health both in England and abroad during the period when the slave trade was active and up to the time when slavery itself was abolished. It cannot be said that the progress was either rapid or widespread. Neither was it due to any stirrings of a national sanitary conscience. The stimuli in the first instance were discomfort and fear, and later, when reasoned action was taken, it was left to individuals to preach the gospel of hygiene and to protest against the absurd practices and superstitions which held the country in thrall. So far, however, as London was concerned, a strong impetus was given towards better things by the Great Fire of 1666, which swept away not only the dregs of the plague, but filthy nuisances of all kinds, and gave an opportunity for rebuilding on sounder lines. The story has been told so often from the days of Defoe that there is no necessity to dwell upon it here. Indeed, a very brief review of advances in hygiene in England must suffice, for these have been fully considered, at least down to 1890, in Sir John Simon's classic, *English Sanitary Institutions*, while Newman, Morris, Garrison the historian,

Creighton the epidemiologist, and many others, in addition to following in Simon's footsteps, have brought our knowledge up to date.

It is, however, worth noting that our earliest vital statistics date back to a period prior to the plague, for in 1662 a certain John Graunt kept church records of births, marriages, and deaths in the city of London.

In 1666 there were distributed in London lists of deaths and certain statistics compiled during the plague. The first London Bills of Mortality were compiled about 1538. They were discontinued, but resumed in 1603 at a time when plague was prevalent.

Although the remarkable changes in the mother country paved the way for world-wide improvements, a better conception of the influence which public health progress exerted on the Empire as a whole can perhaps be gained from a glance at the eventful sanitary history of the Navy, the Mercantile Marine, and the Army, those links with the colonies, and also from a study, so far as it is feasible within the limits of our space, of the developments which have taken place in our overseas possessions.

CHAPTER I

THE HOMELAND

To Richard Mead (1673-1754) must be ascribed the credit of leading the way in that long campaign which has had such momentous results, and which can boast a series of brilliant victories beside which the few failures and rebuffs shrink into insignificance. Mead, and indeed all the pioneers, had perforce to grope in the dark, for they were ignorant of the causes of communicable disease and of its methods of spread. Still it is wonderful how much they accomplished by employing their powers of observation, their reasoning faculties, and their common sense. Mead pleaded for cleanliness and condemned the measures in force for dealing with infected houses. He discouraged gatherings of people in times of epidemics, and held sound views on fumigation.

All these matters were considered in his *Short Discourse concerning Pestilential Contagion and the Methods to be used to prevent it*, a treatise which went through nine editions in Mead's lifetime. While this points to a quickened interest in matters sanitary, it is to be feared, as indeed Simon points out, that the stimulus was, once again, dread of the plague, for the work appeared in 1720 when that disease was playing havoc at Marseilles.

Hard upon the heels of Mead came John Howard, and this squire of Bedfordshire accomplished great work, for he struck at the root of evils whether in dealing with scattered cottages or with noisome prisons. He wrought a revolution in jail hygiene, and by so doing made people think and paved the way for new views on sanitary questions. Yet to this day the state of prisons in some of our colonies is none too satisfactory, and Professor Sir W. J. R. Simpson, a noted tropical hygienist, has had to don the mantle of Howard, and by inquiry and precept seek to remedy conditions which should never have been permitted to exist.

From the imperial standpoint and so far as discoveries in England itself are concerned, the next beacon light was that lit by Edward Jenner. His *Inquiry into the Causes and Effects of the Variola Vaccinæ* was published in 1798, and his great

discovery, despite its traducers and the pusillanimity of governments, has conferred untold blessings on mankind. There can be no doubt that in many tropical countries nothing has advanced the prestige of the white man more than the fact that he brought with him the gift of vaccination. In some of these countries, as, for example, the Anglo-Egyptian Sudan and Mesopotamia, the native knows small-pox as the Englishman knew it in the pre-Jennerian period. He knows it to fear it, and he recognises, in a way to shame the anti-vaccinator, the value of that preventive measure which the genius of Jenner discovered.

There were other pioneers, as a perusal of Simon's pages will show, but for our purpose none need be mentioned till we reach the names of Sharp, Clarkson, and Wilberforce, coupled perhaps with that of Ramsay, who began life as a naval surgeon. These men came into prominence in connection with their never-to-be-forgotten propaganda against the slave trade and slavery. The latter was finally suppressed by the Colonial Slavery Abolition Act, which became law in 1833.

This year, 1833, does not seem very far away, and yet the sanitary state of England at that time was totally different from that which obtains to-day. There was no Public Health organisation, and though the type of dwelling had generally improved, towns were cleaner, a greater sense of decency prevailed, there was some effort at fighting small-pox, and a feeble attempt at quarantine measures was in existence, yet the state of things as viewed in the light of present-day experience was deplorable. Peculiarly sad and debasing, indeed often brutal, were the conditions governing labour, more especially in factories and workshops, and it is to be hoped that the great philanthropic work by which Anthony Ashley Cooper, seventh Earl of Shaftesbury, paved the way for better things will never be forgotten. His is a noble figure, and he is worthy of being classed with Chadwick and Smith, who were his friends and fellow-workers.

The so-called good old days were in large measure dirty and dangerous old days, and it took a man like Edwin Chadwick, a fearless enthusiast, a clear thinker, gifted with dogged determination, to bring about a sanitary reform. And yet Chadwick was a layman, a London barrister who owed much to the influence of that remarkable philosopher, Jeremy Bentham.

Here again the tale has been told, and well told, and

Chadwick's memory is rightly kept green in England. He was the man, as Sir William Collins said, who had visions of a time when "doctors would be unable to live, yet perhaps unable to die." To attain such a desirable result he laboured unceasingly throughout his long life, and was the means whereby the Public Health Act of 1848 came into being. This established the first Public Health Administration in the form of a General Board of Health, and public opinion had been ripened for its institution by the remarkable series of reports on insanitary conditions and their prevention which Chadwick initiated, and for some of which he was himself responsible. Chadwick and those, like Southwood Smith, whom he inspired, who supported him and followed him, were aided in their efforts by the outbreaks of cholera which scourged Great Britain and brought home to its people dangers to which the inhabitants of India and other tropical possessions were daily exposed.

Moreover, by this time Farr had firmly established the science of vital statistics, and the ravages of disease and the results of hygienic measures could now be illustrated in a manner hitherto lacking. How gratifying this would have been to Thomas Percival, who in 1770 made "Proposals for the Establishment of More Accurate and Comprehensive Bills of Mortality in Manchester," and who in 1773 actually managed to make a statistical examination of the population of that city, and was his own critic of the method he adopted!

The Board of Health, though hampered by lack of knowledge as regards the ætiology of communicable diseases, rendered yeoman service, and Dr. John Snow, prior to the third visitation of cholera in 1853-4, advanced the theory that the disease was spread by means of the intestinal discharges of the sick. In these early days, however, the same difficulties which now so frequently militate against sanitary progress in the tropics beset the Board of Health. It fell foul of vested interests, and local authorities bitterly resented central control. There was need of general education in matters hygienic, and education was not forthcoming, for even the most enlightened still saw as through a glass darkly. Hence the Board of Health, despite its manifold activities and useful investigations, came to an untimely end in 1858, but not before it had driven the thin end of the wedge into the mass of apathy, conservatism, ignorance, and opposition which hindered progress. Some enlightenment, however, had

taken place. It is written that "what Lancashire thinks to-day, London will think to-morrow," and it is at least certain that Liverpool was the first city to appoint a Medical Officer of Health. The example was quickly followed by the Metropolis, the care of its health passing into the able hands of John Simon. He himself, as already noted, has told the story of the steady advance under all kinds of disabilities. We cannot follow this in detail, but may note the stimulus afforded it by yet another cholera outbreak in 1865-6, and the appearance in the former year at Swansea of what seems to have been undoubtedly yellow fever. The infection was introduced by the barque *Hecla* from Cuba, which must have had *Stegomyia* mosquitoes aboard her, and the small epidemic was reported upon by Buchanan, as was recalled in a communication to the Royal Society of Medicine in April, 1922, by Colonel Wilkinson.

The principal inquiries of what was now the Medical Department of the Privy Council were concerned with typhus fever, which raged during the cotton famine at the time of the American Civil War, cerebrospinal meningitis, diphtheria, diarrhoea, cholera, lung diseases, and, let it be specially noted, malaria, which still persisted to a considerable extent in the marshy areas of England, and formed the subject of investigation in 1863. Somewhat later, in 1869, to be precise, relapsing fever claimed attention, for it had made its appearance notably in the poorer parts of London. The cholera helped the Sanitary Act of 1866 to become law, and this was an important measure so far as general sanitation was concerned, for it gave powers previously lacking, and, as Simon puts it, "the grammar of common sanitary legislation acquired the novel virtue of an imperative mood." In other words, the "mailed fist," a useful ally if properly and judiciously wielded, made its appearance for the first time. But other forces were at work which eventually were to do more than any "mailed fist" could accomplish. The spirit of research was abroad in the land, and education, both conscious and unconscious, in matters hygienic was beginning to make itself felt. The latter had not yet got much beyond the newspaper stage, but at least children were for the most part being reared under cleanly surroundings, and this alone meant a good deal. The old Scottish motto, "the clartier the cosier," was no longer the slogan of the mob. Gross dirt in public places was becoming uncommon and hence, when seen, proved obnoxious. A sanitary atmosphere had begun

to prevail. As for research, Simon had set Thudichum and Burdon Sanderson to work at a period when the genius of Pasteur was yearly revealing new worlds to be conquered. The whole outlook on preventive medicine was beginning to change. The dawn of the bacteriological epoch was commencing to lighten the dark sky of empiricism and theory.

The time was ripe for change, and the change began with the appointment of the Royal Sanitary Commission in 1869. It laboured to good effect, and the direct outcome of its inquiries was the great consolidating Public Health Act of 1875, fathered by Disraeli and for long the charter of our hygienic liberties. In viewing these earlier efforts it must never be forgotten that the pioneers had to persuade the people to pay in hard cash for many of the improvements advocated, and considering how difficult it is and always has been to raise money for sanitary purposes, the good sense and public spirit of the mid-Victorian appears to merit some recognition, even if fear and discomfort played their usual part in loosening the purse-strings.

The Local Government Board, which came into being in 1871, controlled in some measure the administrative machinery as far as England was concerned; and the development of the latter in Great Britain must be studied if one is to appreciate the guiding principles which have served to mould the sanitary policy of the self-governing dominions and commonwealths.

As Simon points out, and as Morris emphasises, the Local Government Board started badly, for what may be called the Poor Law side became prominent. The Medical Department was relegated to a secondary position. As a result it could not effect what otherwise it might have accomplished. A cholera scare in the early eighties helped one of Simon's successors, Dr. George Buchanan, to develop the usefulness and improve the position of the Medical Department, and he was aided also by the work of the bacteriologist, Dr. Klein, who, though now largely forgotten, was in those days a force in the very limited laboratory world.

A cholera survey resulted in the acquirement of invaluable information not only as regards the sanitary state of many districts, but with respect to the measures taken at ports to prevent the introduction of communicable diseases from abroad, and a *rapprochement* was for a time established between the specialists of the Board and the local health

officers, an alliance subsequently and most unfortunately discontinued. Nevertheless useful work was done in several directions, notably with reference to enteric fever and small pox, and slowly but surely our knowledge of these and other causes of morbidity and mortality was placed on a sounder foundation. Gradually the rôle of the Medical Department of the Board increased until eventually it had to deal with wellnigh everything having a bearing on the public health. At the same time there were other Health authorities, both general and local. For example, factory inspection was controlled by the Home Office, and the Board of Education was concerned with the medical inspection of schools and school hygiene. The Board of Agriculture was responsible for the purity of dairy products and the control of the contagious diseases of animals. Various local governing bodies, such as county councils, urban and district rural councils, and parish councils, came into being and exercised supervision in various directions. It is impossible here to consider all these developments, and their influence upon what may be called imperial hygiene was more or less indirect, though in some respects of considerable importance.

In certain directions there was overlapping, and opportunities for friction and irritation were not wanting, but the general trend was upwards and onwards, and the health statistics demonstrated in no uncertain fashion that, with all its faults, the system which had been evolved was working on sound lines.

A succession of able men, Thorne-Thorne, Power, and Newsholme, guided, wisely and well, the campaign against the forces of disease and death, grappling with problems as they arose, enlarging the scope of operations, and, most important of all, applying the new knowledge gained both at home and abroad to the questions of the hour.

Naturally the vast organisation demanded the creation of posts of all kinds, and turned the thoughts of many to subjects which had never previously exercised the public mind. Special training was found to be necessary if men were to hold sanitary posts to the best advantage. Hence the medical schools instituted courses of instruction, and degrees and diplomas in public health were created. Scotland was well to the fore in this matter, and the University of Edinburgh led the way in establishing a B.Sc. course, examination and degree. Special institutions like the Royal Institute

of Public Health¹ and the Institute of Hygiene came into being and helped to excite interest and diffuse knowledge. The foundation in 1876 of the Sanitary Institute, afterwards the Royal Sanitary Institute, a body which devoted itself chiefly to the training and examination of Sanitary Inspectors, also marked a step in advance, and, as will be seen, this admirably conducted institution has increased its responsibilities and notably enhanced its usefulness not only to Great Britain but also to the Empire. Somewhat similar work has been carried out by the Sanitary Association of Scotland, which was founded in 1875.

All this had an educative effect and bore abundant fruit in bringing home to the populace the significance of what was being done, and impressing upon them the necessity for further effort. The Press, both medical and lay, played a part in the diffusion of information, and by degrees a certain pride was engendered in the results achieved. New legal enactments were framed, passed, and brought into operation, new administrative posts were created, and, most significant of all, perhaps, new spheres of work were annexed. Of these, possibly the most important, and one of the most recent, is that concerned with the prevention and treatment of venereal diseases.

The Great War showed how efficient the sanitary services of this country had become, for, despite the multitude of men returning from abroad infected with divers communicable diseases, or acting as carriers of their exciting agents, the even tenor of the sanitary path was hardly disturbed.

Scarcely was the war at an end when a crown was placed on the edifice which had been built up since the days of Chadwick. A Ministry of Health in 1919 took the place of the Local Government Board and swept into its meshes the other Central Health Authorities. Its formation met with little opposition, for the votaries of the goddess Hygeia had spread her worship far afield; but since its establishment the Ministry, partly perhaps because it embarked on a very ambitious programme and in certain directions was not too successful, has come in for a considerable amount of severe criticism. The suggestion has even been made, that it should be dissolved, but there can be little doubt that the main mass of the people realise that the move has been one in a right direction, and that the Ministry has accomplished valuable

¹ Those who desire details regarding these early dates will find them, together with an historical account of the Royal Institute of Public Health, in the *Journal of State Medicine* for 1924, from January onwards.

work and is a national asset. Hence it is unlikely to be seriously assailed.

Briefly, its functions, which are exceedingly comprehensive, comprise :—

The prevention and cure of disease (other than industrial disease) ;

The avoidance of fraud in connection with alleged remedies therefor ;

The treatment of physical and mental defects ;

The treatment and care of the blind ;

The health of expectant mothers and of children under five not attending a recognised school ;

The medical inspection and treatment of school children ;

The treatment and care of lunatics and mentally deficient persons ;

The protection of infant life ;

The supervision of the working of the Anatomy Act ;

The supervision of midwives ;

The initiation and direction of research (but not including the work of the Medical Research Council) ;

Housing and town-planning ;

The collection, preparation, and dissemination of information and statistics relating to any of these things ;

The training of persons for health services ;

The registration of births, deaths, marriages, and notifiable diseases ;

National Health Insurance, Old Age Pensions ;

Workhouses ;

Rate-supported hospitals (but not voluntary hospitals), including those provided by the Metropolitan Asylums

Board for infectious and other specified diseases ;

Training ships for boys (Metropolitan) ;

Land and river ambulance for the Metropolis ;

Cemeteries.

The administration called into being for the carrying out of these functions formed the theme of an able and comprehensive address delivered by Sir George Newman, the Chief Medical Officer, Board of Education and Ministry of Health, to the public health representatives of foreign governments visiting Great Britain. A syllabus thereof was printed in one of the useful Public Health Reports of the U.S.A., and is here transcribed, as it affords a kind of bird's-eye view of the extensive armamentarium now required to deal with all aspects of the public health.

PUBLIC HEALTH ADMINISTRATION IN GREAT BRITAIN

1. The English system of local government :—

Principle : Every citizen shares in the State, the consolidation of which depends on local autonomy and efficiency.

- (a) The Crown.
- (b) Parliament.
- (c) Central departments of State: Ministry of Health, Home Office, Board of Education, etc.
- (d) County Councils.
- (e) Local sanitary authorities—urban, rural, port.
- (f) Local education authorities.
- (g) Parish councils.
- (h) Poor unions (medical relief and vaccination).
- (i) Special bodies for special purposes, *e.g.*, river boards, hospital boards, insurance committees, etc.
Duties and functions of these various bodies ; how elected ; permanent and temporary ; paid and voluntary services. Rates and taxes, loans, exchequer grants.

2. English sanitary law and institutions :—

Early sanitary legislation (a) Epidemics (leprosy, plague, cholera, small-pox) ; (b) Growth of knowledge ; (c) Reports : Poor Law Commissioners (1838) ; Privy Council (1856) ; and the Registrar-General, leading to legislation, 1846, 1847, and 1848 ; (d) Social evolution ; the modern movement ; environment versus personal factor.

Types of chief legislation now in force :—

1. Vaccination Acts, 1867, 1871, 1898, 1907.
2. Public Health Acts, 1875-1891, and their amendments.
3. Rivers Pollution Acts, 1876.
4. Sale of Food and Drugs Acts, 1875-1899.
5. Local Government Act, 1888.
6. Infectious Diseases Notification and Prevention Acts, 1889, 1890, 1899.
7. Housing of Working Classes Acts, 1890, 1909, 1919.
8. Factory and Workshop Acts, 1893, 1901.
9. Isolation Hospital Acts, 1893, 1901.
10. Notification of Births Acts, 1907, 1915.
11. National Insurance Acts, 1911-1921.
12. Feeding, Medical Inspection, and Protection of Children, 1906-1921.
13. Mental Deficiency Act, 1913.
14. Milk and Dairies Acts, 1915, 1922.

15. Venereal Disease Act, 1917.
16. Maternity and Child Welfare Act, 1918.
17. Midwives Act, 1918.
18. Miscellaneous Acts (Canals, Burial, Water, Alkali, Cleansing of Persons, etc.), By-laws, Adoptive Legislation and Corporation Acts.

3. Duties of medical officers of health and school medical officers :—

Administration, advisory, investigation and prevention of infectious disease, inspection, reporting; The school medical service; Qualifications; Methods of appointment; Duties of sanitary inspectors.

4. Public medical services :—

Poor law, public health service, school medical service, insurance medical service.

5. Powers and obligations of medical practitioner :—

- (1) Notification of births.
- (2) Death certificate.
- (3) Notification of infectious disease.
- (4) Notification of industrial poisoning.
- (5) Cleansing house certificate.
- (6) Disinfection certificate.
- (7) Offensive trade and other nuisances.
- (8) Removal and burial of body, etc.

6. The establishment of a Ministry of Health :—

Its scope of duties.

Scotland has a Board of Health, also appointed in 1919. Its powers and duties are similar to those of the English Ministry of Health, and, in addition, it has power under the Alkali Works Regulation Act, 1906, and the Rivers Pollution Prevention Acts, 1876, 1893, and 1897.

The Irish Public Health Council (1919) has powers and duties equivalent to those of the English Health Ministry.

As to the result of all this activity, this progress, this enlightenment, we need merely say that since the early days of Queen Victoria's reign the general death-rate for the population of England and Wales has been wellnigh halved. So has the infantile mortality rate, while the tuberculosis rate has fallen one-third. The greater part of this improvement has taken place within the last thirty years.

Sir George Newman in a plea for the permeation of the

medical curriculum by preventive teaching, a suggestive paper outlining a new departure, cites some victories of preventive medicine. Referring to enteric fever, he says :—

“ Inoculation is available, and has been used in exceptional circumstances, though not widely, in the civil community. Its value, in conjunction with general and special sanitation, in the European War, 1914-18, is unquestioned. In the South African War the British Army strength was 208,000 ; there were 58,000 cases of typhoid, and 8000 men died of it. In the European War the British Army on the Western Front had a strength exceeding a million men, but there were less than 7500 cases of typhoid, and only 266 deaths. In the army or the civil community the result is the same : the disease is conquered.”

Dealing with small-pox, he remarks:—

“ In London from 1660 to 1780, Farr estimated from the bills of mortality that small-pox caused upwards of 4000 deaths per million living. In England and Wales in 1838-42 the rate was 575, and in 1886-90 it had fallen to 14 per million. Why ? Because of vaccination. It has been proved beyond doubt that vaccination was the specific agent in this decline, the specific protection against this disease. The malady was all but a universal scourge, and it is now entirely controllable.”

Passing to tuberculosis, he notes that :—

“ In 1847 the death-rate per million from phthisis in England and Wales was 3189. It has steadily declined for seventy years, and in 1921 it was 854. Non-pulmonary tuberculosis is likewise declining. If the disease be as widely distributed as is generally supposed, it must indeed be one of the most curable of the great scourges. What is the explanation of its decline ? The answer is prevention.”

And finally, turning to the question of infant mortality, he reminds us that :—

“ At the end of the nineteenth century there died every year in England and Wales 150 infants per 1000 born. In many industrial districts the figure was 300. In 1922 it had fallen for the whole country to 77. What has happened here ? No doubt many factors have contributed, but the most potent have been more enlightened motherhood and infant nurture.”

Many other examples might be given, but these will serve, for they show clearly the great change which has signalised our passage from darkness to light and which has been the outcome of the application of the knowledge gained at first by harsh experience and later at the footstool of Science. At the same time we are perhaps a little apt to be obsessed by the importance of death-rates. A timely warning on this matter has been issued by Jervis of Leeds. He points out that a time must come when, so far as the death-rate for the general population is concerned, a figure will be reached beyond which it is humanly impossible to go. Hence he directs attention to what he calls "Damage"—to the loss of efficiency produced by disease. It is no doubt difficult to appraise, and it is still more difficult to prevent and treat upon a large scale, but if the reproach of being a "C 3" nation is to be removed, the co-operation of health officers is required, their vista and usefulness must be extended.

As noted, there is one important branch of health work which does not come under the ægis of the English Health Ministry. This comprises the far-reaching inquiries conducted by the Medical Research Council, the success of which is due in large measure to the energy and enthusiasm of Sir Walter Fletcher, the able secretary of that body. This undertaking, one of great significance from the hygienic standpoint, forms part of the National Health Insurance scheme introduced in 1911, and is under the jurisdiction of the Privy Council.

We have traced briefly and imperfectly the steps which have led to a sanitary revolution in Great Britain, but so far have not considered certain developments which produced a far wider, if not so intensive a change in outlook. These were intimately bound up with the study of parasitology, and more especially that branch of it known as protozoology, which deals with the lowly animal organisms that have been shown to play so great a part in tropical pathology. The commencement of this study may, with good cause, be attributed to the Dutchman, Leuwenhoek (1632-1723), so far as protozoa are concerned, while to the Swede, Rudolphi (1771-1832), may be given the honour of having placed research into helminthology, *i.e.* the study of the parasitic worms, upon a sound basis owing to his work on classification.

From the imperial point of view there can be no doubt that although protozoology made great progress from the days of Leuwenhoek onwards, the two great discoveries

which above all others served to link it up with sanitary endeavour were those of Lösch and Laveran. In 1875 the former differentiated and described *Entamoeba histolytica*, the cause of amœbic dysentery, while in 1880 Laveran discovered the plasmodium of malaria. This discovery, once its importance had been recognised, exercised a profound effect throughout the world, for without it there would have been no sound basis for the inductions of Manson and the brilliant researches of Ross. One has only to see, as we shall see, how through the ages men groped for the truth about the cause of malaria and how, because its parasite eluded them, they remained baffled even when very near the truth, to understand all that Laveran did for science and for mankind. Yet, as will also be seen, long years elapsed before the natural corollary of his observations was fully exploited. Until Manson, Ross, and the Italian workers took the field Laveran's discovery, so far as the public health is concerned, possessed only a scientific interest.

If Lösch and Laveran paved the way for a new outlook in protozoology it was Perroncito's recognition in 1880 of *Ancylostoma duodenale* as the cause of the grave anæmia in workmen tunnelling through the Alps that gave to helminthology a new importance in the realms of hygiene, even though the relation of chlorosis and ancylostomes had been previously demonstrated.

It is true that prior to the above date the mysteries of trichinosis had been elucidated, Lewis in India had found microfilaria in human blood, and Bilharz had described the trematode which for long bore his name; but trichinosis, filariasis, or schistosomiasis cannot for a moment compare in gravity or in geographical incidence with ancylostomiasis. Yet here again, it is only of recent years that the full significance of the malign influence exerted by ancylostome infection has been fully grasped, and it was not until the Americans, backed by Rockefeller's millions and filled with that idealism which so often spells success, declared war upon the ancylostome that any concerted action was taken to deal with a condition which was, and is, sapping the energy of millions and causing immense economic loss.

Protozoology and helminthology had scarcely established themselves as important factors in imperial hygiene when it became necessary to range entomology along with them. The association of certain insects with disease had long been known. Even if mosquitoes alone are considered, we find

that Susrutu, the Indian physician who flourished in the fifth century A.D., ascribed fever to the bites of gnats, and many other observers attributed the transmission of infections—notably malaria and yellow fever—to these insects. The first definite proof, however, of a blood-sucking insect acting as a vector of pathogenic human blood parasites was furnished by Manson when working in Amoy in 1877. Not only did he show that *Microfilaria bancrofti* passed from man to the mosquito, *Culex fatigans*, but he demonstrated what happened to it in its insect host, and indeed proved that the insect was a host, a true intermediate host, a necessary link for the fulfilment of the life-cycle of the blood worm. Manson, by careful and profound reasoning, conceived this new idea in pathology and did not rest until he had proved its truth. At the same time he did not trace the developed worm back from the mosquito to man. That was left to Low, working at Manson's request on a hypothesis of Bancroft. Manson's epoch-making work, for it was nothing less, carried out in time snatched from the rush and cares of general practice, pursued in an out-of-the-way part of the world far from scientific help and encouragement, was the means whereby the foundation was laid for the medical conquest of the tropics. The fight has not yet been won, but that is not Manson's fault or that of those who followed him. Failure, where it has occurred, has been due rather to the parsimony of governments, the real lack of funds, the blindness, wilful or otherwise, of legislators, the ignorance and indifference of the laity, the strangling hold of vested interests, the apathy begotten of climate, the doubts engendered by ill-devised or badly conducted campaigns, and, in some places, by natural difficulties too great to be overcome at any reasonable cost. Yet consider all that has come about as a result of Manson's having lived and worked in the tropics. The Americans, Smith and Kilborne, took up the study of red-water in cattle, which was known to be due to a parasite living in and destroying the red blood cells. They found that this piroplasm, or babesia as it is called, was conveyed from the sick to the healthy by a species of tick, a piece of work which placed the prevention of this serious disease upon a sound basis. Bruce, an investigator of outstanding merit, aided by a wife well-nigh as skilled as himself in scientific pursuits, Bruce, who in the bacteriological field had won his spurs as the discoverer of the organism causing Malta or Undulant Fever, took a microscope with him to Zululand, and, recalling

the filaria and the mosquito, the piroplasm and the tick, established a link between the trypanosome of nagana and the tsetse fly, *Glossina morsitans*. Influenced and encouraged by Manson, who by this time had formulated views—not new indeed, but, thanks to Laveran's discovery and his own inquiring mind, more advanced than those hitherto put forward—regarding the possible transmission of malaria by mosquitoes, Ross of the Indian Medical Service toiled unceasingly at bird malaria and emerged triumphant, for, in addition to proving that mosquitoes were the vectors of the parasite concerned, he traced step by step the development of the parasites in the insects and was able to demonstrate conclusively the whole mechanism of transmission. Turning his attention to human malaria, he got far enough to indicate that certain mosquitoes were vectors of the plasmodium, but the full life-cycle of the malarial parasite in the anopheline was worked out by the Italians, Grassi, Bignami, and Bastianelli. But Ross was not content with protozoological research alone. He viewed the whole malaria question from the sanitary standpoint, and, in the light of the new discoveries, commenced crusades against the carriers of infection. These crusades were sometimes launched from England, sometimes developed locally, and in certain places they achieved remarkable results, as will be seen in due course.

A new stimulus was given to research work in tropical medicine and hygiene, and fortunately at this time there was in office a Colonial Secretary with the seeing eye and the understanding heart. Advised by Manson, the father of modern tropical medicine, Mr. Joseph Chamberlain on March 11th, 1888, circularised the General Medical Council and the leading medical schools of the United Kingdom in the following words, pointing out "the importance of ensuring that all medical officers selected for appointments in the tropics should enter on their careers with the expert knowledge requisite for dealing with such diseases as are prevalent in tropical climates"; and that it was very desirable that, before undergoing such special training, the future medical officers of the colonies should be given facilities in the various medical schools for obtaining some preliminary knowledge of the subject. . . . "I would be prepared," he added, "to give preference in filling up medical appointments in the colonies to those candidates who could show that they had studied this branch of medicine, especially if some certificate or diploma to that effect were forthcoming."

In its reply the council said: "While the council is not prepared to recommend that tropical medicine should be made an obligatory subject of the medical curriculum, it seems highly advisable, in the public interest, that arrangements should forthwith be made by the Government for the special instruction in tropical medicine, hygiene, and climatology of duly qualified medical practitioners, who are selected for the colonial medical service, or who otherwise propose to practise in tropical countries."

On May 28th, 1898, the Colonial Secretary notified all Governors of Colonies as to the action he had already taken, and continued:—

"The great mortality of Europeans in such climates as those of the West African Colonies and Protectorates has not failed to attract my notice from the first, as it had that of my predecessors in office, and towards the end of the year 1897, largely through the interest taken in the matter by Dr. Manson, who had succeeded Sir Charles Gage-Brown as Medical Adviser of the Colonial Office, my attention was more definitely directed to the importance of scientific inquiry into the causes of malaria, and of special education in tropical medicine for the medical officers of the Crown colonies.

"In pursuance of the second of these two objects, it was clearly advisable (a) that a special training school in tropical medicine should be established, where officers, newly appointed to the medical services of the colonies and protectorates, might be given systematic instruction, with special facilities for clinical study, before leaving England to take up their appointments, and where doctors already in the service might, when on leave, have opportunities of bringing their professional knowledge up to date; (b) that all the leading medical schools in the United Kingdom should be invited to give greater prominence than hitherto in their schemes of study to tropical medicine; (c) that the medical reports periodically sent from the tropical colonies and protectorates should be recast on one uniform type, designed to throw light on the diseases which are most prevalent in tropical countries, and to indicate the methods likely to be most successful in preventing or curing such diseases."

It may well be doubted if a despatch of greater import was ever penned by a Secretary of State for the Colonies. In the following year the London School of Tropical Medicine came into being. But, as so often happens, private enterprise outstripped governmental initiative, and, by a few months, the kindred school of Liverpool became the first of its kind

in the world. The accomplishment was wholly due to the merchant prince, Alfred Lewis Jones, who had great interest in the African West Coast, and to the indefatigable and enthusiastic Dr. Rubert Boyce, who became the Dean of the school, and laboured in its service until his untimely death.

With Manson as the moving spirit in London, and Boyce at the helm in Liverpool, the success of the embryo schools was assured, and they embarked in friendly rivalry on their remarkable careers at the close of a century which had witnessed a vast expansion and a great consolidation of the British Empire, without, however, a corresponding development in the forces controlling disease and making for health, chiefly because until the last few years knowledge of "the Why and the Wherefore" was still to seek.

So far as Great Britain is concerned, the subsequent events having a bearing on public health and the Empire may be briefly summarised. Two of the great medical schools, Edinburgh and Aberdeen, founded courses in tropical medicine and hygiene. Just as it had been found necessary to establish examinations and degrees and diplomas in hygiene, so it proved essential to crown the special teaching by tests of knowledge, and to confer visible tokens of efficiency on those who passed them. The London and Liverpool schools merely grant certificates, but their courses qualify for the Diplomas in Tropical Medicine and Hygiene of Cambridge University and the conjoint board of the Royal Colleges of Physicians and Surgeons of London.

A similar diploma can be gained at Edinburgh University. The University of Liverpool and the National University of Ireland have diplomas in tropical medicine, and an M.D. in this subject is bestowed by the University of London.

Quite recently the Royal Sanitary Institute, which has for many years held examinations in general sanitation for sanitary inspectors abroad, went a step further, and commenced to hold in Great Britain examinations in tropical hygiene for inspectors working in, or destined for, the tropics. This is a matter of considerable importance, as there has been a tendency in many colonies not to apply practically the knowledge gained. Such practical application is pre-eminently the business of the sanitary inspector acting under the Medical Officer of Health, and the manner in which tropical hygiene in certain respects differs from sanitation in temperate climes makes it necessary that sanitary inspectors in, or proceeding to, the colonies should be specially qualified.

Not only so, but they should also be specially trained. Here again, as a temporary measure, the Royal Sanitary Institute has led the way. The future in this respect will be considered in the chapter dealing with "Outlook."

The two schools of London and Liverpool have every now and then despatched expeditions to the tropics, usually the British tropics, or to subtropical countries, for the study of disease. No fewer than nineteen such embassies of health have proceeded from London, while Liverpool has sent out thirty-two, and, in addition, has established laboratories for research at Manaos on the Amazon and in Sierra Leone.

A society of tropical medicine and hygiene, founded in London in 1907 by Dr. (now Sir) James Cantlie, an intimate friend and colleague of Manson, became a Royal Society in 1921, when under the presidency of Professor (now Sir) W. J. R. Simpson, so well known for his work on tropical sanitation. The Society was further honoured when, in December 1923, His Majesty graciously consented to become its Patron. This society has done a great deal to advance the cause of tropical medicine and hygiene, for it has Fellows in every British possession as well as in other countries, and its Transactions find their way into various corners of the Empire.

The Royal Society itself was early in the field. In 1898, at the request of Mr. Joseph Chamberlain, it formed a Malaria Committee for research into that disease in Africa. In 1903 this became the Malaria and Tsetse Fly Committee, and in 1904 it assumed the title it still bears, the Tropical Diseases Committee.

It was under the auspices of the Royal Society that Low and Castellani, and later Sir David Bruce with other colleagues, investigated African sleeping sickness, proved the ætiological rôle of *Trypanosoma gambiense* and incriminated *Glossina palpalis* as its vector.

Naturally the Colonial Office, with the example of Mr. Chamberlain as a beacon light, has played its part in the fray. It would take too long to recount its varied activities, but it may be said that, in addition to financing, in part or wholly, several of the expeditions to which reference has been made, it established in 1908 the Sleeping Sickness Bureau, of which Dr. A. G. Bagshawe was appointed Director. This bureau was instituted for the purpose of collecting and distributing, by means of a bulletin and otherwise, information regarding African sleeping sickness, and was intended also

to serve in an advisory capacity. Its usefulness soon became so apparent that its services were invoked in connection with the disease Kala-azar, which Sir William Leishman of the Army Medical Service had shown to be due to a protozoan parasite; and eventually, in 1912, it became the Tropical Diseases Bureau, one of the most valuable institutions extant for the collection of facts, the diffusion of knowledge, and the encouragement of the worker. No more admirably conducted periodical than its *Bulletin* exists, and it has proved itself indispensable to the profession abroad.

In connection with the Colonial Office there was also constituted in 1909 an Advisory Committee which dealt with matters of medical and sanitary interest in the tropical African dependencies. This proved of value, and in 1922 its scope was extended so that all such matters in any of the colonies and protectorates might be submitted to it if the Secretary of State so desired. Its title accordingly became The Colonial Advisory Medical and Sanitary Committee.

Other special activities, if space permits, will receive mention under the section dealing with individual diseases, but the work of the Lister Institute in the domain of tropical research merits special attention, for it has played an important part in several directions.¹ Mention must also be made of the British Empire Leprosy Relief Association recently founded at the instance of Sir Leonard Rogers. Its work is intended not only to ameliorate the lot of lepers in all British possessions but by providing for treatment and segregation actually to stamp out the disease. The programme is ambitious, but by no means impossible of attainment, and a good start has already been made under favourable auspices.

Private beneficence has not been lacking. Mr. Henry S. Wellcome, who in 1902 presented the equipment of research laboratories bearing his name to the Sudan Government (see p. 112), founded in London in 1913 the Wellcome Bureau of Scientific Research, which was primarily intended for investigations into questions connected with tropical medicine and hygiene. A graphic museum on novel lines has been built up in connection with this Bureau and serves a useful educative purpose, supplementing the training given in the London and Liverpool schools, and at Edinburgh and Aberdeen Universities.

¹ So has the Natural History Museum, South Kensington, especially in the domain of entomology.

In 1922 there was opened at Cambridge, thanks to funds provided by Mr. and Mrs. Molteno, an Institute of Parasitology, which, under Professor Nuttall's guidance, is intended in large measure to further the study of both human and animal diseases of the tropics, and is thus directly connected with the public health activities of the Empire.

Martyrs have not been lacking in the cause. Some, as, for example, Armand Ruffer, perished during the Great War. The war itself undoubtedly gave a great fillip to the study of tropical sanitation, more especially with regard to the improvisations required during field operations, many of which are suitable also for everyday life amongst more or less uncivilised communities. Furthermore, the campaigns in the Mediterranean area, Mesopotamia, East Africa, and elsewhere, brought many medical men into touch with the diseases of warm countries and the problems of tropical hygiene, and served to quicken interest generally in the welfare of many of our colonies.

CHAPTER II

THE NAVY AND MERCANTILE MARINE

THE thought of all this work at home and abroad naturally suggests the links which bound and still bind the mother country to her overseas possessions—the vessels of war, the ships of commerce, the argosies of a nation. Indeed the earliest known work in English on tropical diseases is concerned with ships and sailors. Its full title is *The Cure of the Diseased in Remote Regions, Preventing Mortalitie, Incident in Forraine Attempts of the English Nation*, and its author was a layman, a ruffling Elizabethan gallant yclept George Whetstone. His book, which was published in 1598, has little to commend it, but deals with fevers, heat-stroke, dysentery, scurvy, and other ailments. It was reproduced in facsimile and furnished with an introduction and notes by Dr. Charles Singer in 1915.

Something has been said of the galleon and the caravel; we have touched upon the vileness of the slavers; but perhaps to appreciate fully the amazing indecencies of life at sea two hundred years ago we must have recourse to the robust pages of Smollett, who, a trained physician, possessed the "sanitary eye and nose."

Turn the pages of *Roderick Random* and read his account of a line-of-battle ship, and more especially of its cock-pit, the place allotted for habitation of the surgeon's mates. He says, "I was filled with astonishment and horror. We descended by divers ladders to a space as dark as a dungeon, which I understood was immersed several feet under water, being immediately above the holds. I had no sooner approached this dismal gulf than my nose was saluted with an intolerable stench of putrefied cheese and rancid butter that issued from an apartment at the foot of the ladder resembling a chandler's shop." Again, in describing the sick berth or hospital, he remarks, "I was much less surprised that people should die on board than that any sick person should recover. Here I saw about fifty miserable dis-tempered wretches, suspended in rows, or huddled one upon another, that not more than fourteen inches space was

allotted for each with his bed and bedding ; and deprived of the light of the day, as well as of fresh air ; breathing nothing but a noisome atmosphere of the morbid steams exhaling from their own excrements and diseased bodies, devoured with vermin hatched in the filth that surrounded them, and destitute of every convenience necessary for people in that helpless condition."

There is more, much more in the same strain, but we need only quote the account of how yellow fever broke out at Carthage on this floating hell. "The change of atmosphere," says the novelist, "conspired with the stench that surrounded us, the heat of the climate, our own constitutions, impoverished by bad provisions, and our despair, to introduce the bilious fever among us, which raged with such violence that three-fourths of those whom it invaded died in a deplorable manner ; the colour of their skin being by the extreme putrefaction of the juices changed into that of soot."

Accounts of old voyages and expeditions often confirm Smollett's graphic pictures of the sea life of these times, and it is difficult nowadays to realise the conditions under which the sailors of the eighteenth century frequently served, more especially when their ships were in the tropics.

Yet it was these very conditions which moved certain enlightened men to protest, to carry out research, to make tireless efforts for their improvement. Prominent amongst naval hygienists stands James Lind (1716-1794). He it was who, as already stated, discovered anew the method of obtaining fresh water by distilling sea-water, if indeed he was not the introducer of a new, simple, cheap, and effective process of such distillation. This was used on the *Dolphin* on her voyage round the world in 1768, and gave great satisfaction. Moreover, he discovered a method of "dressing victuals" in the steam of his apparatus should fresh water be scarce. His works can be read with profit and interest at the present day. He was a man in advance of his times, wise, sagacious, and broad-minded, a keen and accurate observer, with the experimental type of brain and a great heart. Lind's is a noble figure, and the Navy was fortunate in having him as physician to its hospital at Haslar.

In his remarkable essay on how to preserve the health of seamen in the Royal Navy, Lind strikes the right note in his *Advertisement*, where he says: "For the number of seamen in time of war, who die by shipwreck, capture, famine, fire, or sword, are but inconsiderable, in respect of

such as are *destroyed* by the ship diseases, and by the usual maladies of intemperate climates."

It is impossible here to quote at length from this essay and from his other works, and yet certain of the passages and some of his views are so interesting that we venture to include them.

He it was who pointed out the great risk from typhus owing to the guard-ships and tenders bringing off to the vessels of the fleet pressed men, and more especially the scourings of jails, whose clothing was often filthy and swarming with vermin. Indeed he wrote a dissertation on the jail fevers, and prescribed preventive measures which would almost do honour to a hygienist of the present day.

Here are his rules for prophylaxis :—

1. A wind-sail fixed on the top of the house to ventilate the prison.
2. A *bathing room*, with *bathing tubs* and a copper for heating the water, to which a small quantity of *vinegar* was occasionally to be added. Here all unclean persons, when first received into prison and before going in to court should be washed and cleaned.
3. An *oven* for destroying vermin and removing infection from tainted rags and apparel.
4. A *smoak house* for purifying larger quantities of infected cloathes and bedding than the oven can receive.
5. Twenty or thirty complete suits of *washing dresses* in which the prisoners are to be cloathed when in court, or under examination, as also several *dresses* for the infirmary appropriated solely to the use of the sick.

Lind was an authority on scurvy, and wrote a treatise upon it. He was sound on the subject of the juice of lemons, not limes, although he recognised that lime-juice had some anti-scorbutic properties. Not only does he recommend orange-juice, but he gives a simple method of preserving it. He does not overlook, as some reformers are apt to do, the question of expense. Speaking of the value of cream of tartar in preventing scorbutic states, he notes that one-eighth of an ounce a day is sufficient, and this supply will cost only one shilling yearly for each man in the West Indies. He devised a method for the preservation of vegetables and another for growing watercress on blankets and thereby converting vessels into regular masses of verdure, as he says. He discourses on ventilators, both those of Sutton and of Hales,

and was a great advocate of fresh air. He deals with methods of cooling and purifying water. In this connection it would seem that, as ever, there is nothing new under the sun, for he cites a method of purifying water by means of unslaked lime employed in Senegal. Yet Houston's "excess lime" method came into vogue only the other day. Lind did not confine his writings to his own discoveries. He mentions and approves those of others, and was clearly of a generous disposition. In his work on diseases in hot climates he speaks of a method of freshening putrid water first discovered, as he notes, by the ingenious Mr. Ostbridge, a lieutenant in the Navy, and of which he says: "The quickest method of sweetening such water is, by passing it through a series of vessels, placed under each other, having very small holes bored in their bottoms, so that it may fall in small drops, like a gentle shower of rain, through each of them into a receiver fixed below. The wind, or air, having then a free passage through the water, divided into small drops, will soon render it wholesome and sweet."

Presumably some of his suggestive "Precautions in Southern Climates," such as anchorage away from swamps, avoidance of night air, closing gun ports at night, screening by a sail and the use of smoke, are also culled from other sources, but the idea of employing ships as off-shore floating "factories" on which people could live and remain healthy, as on the African West Coast, is his own idea. The measures advocated in this chapter are so sound that one wonders he did not stumble on the mosquito-man relationship where malaria is concerned. He advocates quinine prophylaxis, "a dram of bitter infusion of bark evening and morning," and elsewhere speaks of "that grand febrifuge, the Peruvian bark, the only specific yet known for the malignant diseases of those climates."

There is much more that might be quoted with advantage, but we will conclude with a passage as wise and true, at least for his day, as that with which we commenced the account of this great naval hygienist. Discussing the arrest of epidemics, he says:—

"The specific nature and qualities of contagions differ from each other and are in many respects inscrutable. How far does each extend its sphere of activity? Who can explain why the small-pox will infect persons but once during their life, while the plague and other infections attack again and again? There are

unquestionably certain limits prescribed to human researches beyond which, tho' fancy may take its flight, and theory make wide excursions, all is conjecture, obscurity, or profound darkness."

A glance at Lind's statistics will show how greatly conditions have altered since his time. Take, for example, his note on the 5743 patients admitted to Haslar Hospital from 1st July, 1758 to 1st July, 1760. Of these 2174 were afflicted with fevers, 1146 with scurvy, 53 with small-pox, and 30 with leprosy. What a furore would now be created if such entries occurred in the year of grace 1923! Lind held, as every reasonable man must hold, that prevention is better than cure, and his chief efforts were directed towards prophylaxis. Yet in his day, as indeed in our own, there was evidently a tendency to spend money chiefly on the medical and surgical side. Thus, while very little was expended on hygienic requirements on board ship, we gather that the hospital at Haslar, founded in 1754, was well designed and very commodious, for we read of its wards being about 60 feet long, 23 feet broad, and 12 feet high, each capable of accommodating twenty infected persons with ease and without any inconvenience, provided attention was paid to cleanliness and keeping up a constant circulation of air. It is the same old story—large, expensive hospitals and due care taken to keep them full to overflowing with cases of preventable disease. Lind lived and laboured, but it was not until 1844 that lemon-juice was made a compulsory issue in the British Navy. Its occasional use from a much earlier period was due to Sir Gilbert Blane who, not perhaps a scientific inquirer of the order of Lind, was yet a stout, if urbane, hygienist who did much for the reform of conditions prejudicial to health, and whose *Dissertations and Observations on the Diseases of Seamen* reveal him to have been a worthy disciple of the pioneer.

Another follower of Lind deserving of mention was a certain Dr. Baird, whose representations regarding the prevention of scurvy were the cause of action being taken in the case of the fleet off Brest, and later in the Channel Fleet.

It is curious how lime-juice, only one-fourth as potent as lemon-juice, was permitted after 1860 to replace the latter, and it is still more curious that it was not until 1919 that the full significance of this supersession was discovered. We owe this interesting sidelight on naval hygiene to the researches

of Mrs. Henderson Smith of the Lister Institute. Lind who, contrary to Simon's belief, did serve afloat, visiting the West Indies, the Mediterranean, and the African coast, must have been gratified to see by the achievements of that master mariner, Captain Cook, that he had not worked nor taught in vain. Where Anson, for lack of precautionary measures, had paid a terrible penalty, Cook succeeded brilliantly, owing to his care and foresight in following out the maxims of Lind and the latter's co-hygienist in the Army, Sir John Pringle (*vide infra*). Anson's flagship, the *Centurion*, within a space of nine months lost 292 out of a crew of 506 from cold, damp, and scurvy, or a culpable neglect of hygienic principles. Cook, who received the Copley Gold Medal of the Royal Society, sailed round the world in the *Resolution* with a company of 118 men in a voyage which lasted three years and eighteen days, and lost only one man from disease.

Cook himself says :—

“ In conjunction with fresh provisions and vegetables, and with a continual supply of fresh water to the men, the most material part of the arrangements was that proper methods were taken to keep their persons, hammocks, bedding, clothes, etc., constantly clean and dry. Equal care was taken to keep the ship clean and dry between decks. Once or twice a week she was aired with fires, and, when this could not be done, she was smoked with gunpowder mixed with vinegar and water. I had also a fire made in an iron pot at the bottom of the well, which was of great use in purifying the air in the other parts of the ship.”

Collingwood likewise followed these methods with great success. Even so, however, note what Masefield says in his fascinating volume, *Sea Life in Nelson's Time*. It is true he does not go deeply into questions of naval hygiene, but he does observe that “ in spite of all the fumigations the ships were never free from unpleasant smells : the dank fusty smell of dry-rot, the acrid and awful smell of bilge water, and the smells of decaying stores and long defunct rats.”

Just as Lind died long before lemon-juice was officially introduced into the Navy, so Blane, thanks to the apathy of the Central Admiralty Board, did not see compulsory vaccination, of which he was a powerful advocate, brought into force. He died in 1834, and the reform came into being only in 1858.

The epoch during which Lind and Blane flourished was a

very remarkable one from the hygienic standpoint, and there can be little doubt that it owed its activity to the presence of war. There probably never was a war which did not result in some advance, even if only temporary, in sanitary knowledge and practice—a truth amply exemplified in our own times.

Others who helped along the good work were Trotter, Fletcher, Turnbull, and Finlayson. Of these Trotter (1760-1832), a fearless and rugged man, and a Scot like both Lind and Blane, was the most outstanding. He insisted on ventilation, preached the gospel of hygiene, condemned the evils of the press-gang, upheld compulsory vaccination, and proclaimed the dangers of alcoholism. An ardent reformer, he was not always tactful, but his ability was undoubted, his aims were entirely unselfish, and his energy was tireless. In very truth it had need to be so. Here is what an American naval surgeon writes of the great trio: "They struggled against stupidity, ignorance, prejudice, and indifference in high places and low, the Admiralty and the forecandle; they had the hard task of seeking to break down immemorial custom; dared to challenge tradition; hammered at the walls of a hierarchy as soul-chilling, as rigorous, as iron-bound as any Brahmin caste; preached seemingly frivolous novelties to insular conservatism that held hardship essential for hardihood."

Yet in the end they triumphed, and Taylor, the American, rightly dubs them heroes.

Coming to a later period, the stimulating influence of Sir William Burnett (1779-1861) who was Medical Director-General for many years must also not be forgotten. It was in his time and under his direction that Bryson issued in 1847 his *Report on the Climate and Principal Diseases of the African Station*, a compilation of very considerable merit even if our scientific knowledge at that time had made no great progress. His account of the West Coast may be read with interest, and he gives the following comparative table which is significant, though the bad record for the African coast was dependent to some extent on peculiar conditions of service largely connected with the slave trade.

Death-rate per 1000 for 21 years (1825-1845) :—

South America	7.7	East Indies ..	15.1
Mediterranean	9.3	West Indies ..	18.1
Home ..	9.8	Coast of Africa	54.4

The table would seem to show that at this period we had mastered the problem of keeping men healthy on board ships, so long as they were for the most part at sea, but that insect-borne disease and doubtless other maladies, now preventable, still took toll of our naval forces in the tropics when in close touch with the shore. Long before Bryson's day, however, namely in 1813, there appeared rather a remarkable compilation from the pen of Dr. James Johnson, who had served for three years in the Indian seas as surgeon to a ship-of-war, and who had to give up his appointment as he suffered severely from dysentery and liver abscess. His book entitled *Influence of Tropical Climates on European Constitutions* had a great vogue and went through six editions, being eventually merged in the work of Martin, who was a Bengal army surgeon and an author of distinction. Johnson's writings exercised a great influence in his day, and the part of his book dealing with tropical hygiene is very sound within its somewhat limited compass.

So far as original writers are concerned, a period of inertia succeeded the almost feverish activity displayed in all directions during the Napoleonic era, and, though Saunders and Armstrong produced works dealing with naval hygiene, it was not until Macdonald, an Inspector-General and Professor of Naval Hygiene at the Army Medical School, Netley, brought out his book in 1881 that public attention was much drawn to the subject. At the same time a good deal had been done in various directions, more especially to combat the scurvy which persisted long after the days of Lind. Indeed, Arctic exploration redirected attention to this disease even after 1867, when the compulsory lime-juice issue had been doubled.

Naturally the change from sail to steam worked a revolution in naval matters, and hygiene had to keep pace with this development. Questions of ventilation came much to the fore, as a perusal of Macdonald's pages will show. These also demonstrate how remote a period is 1881 from the point of view both of ship construction and naval hygiene.

Again, however, we are reminded how history repeats itself, for this author recounts attempts at the introduction of a lime-juice lozenge both into the Navy and the merchant service, while as late as 1920 Rear-Admiral P. W. Bassett-Smith (later Sir Percy Bassett-Smith), then Lecturer in Tropical Medicine and also Director of the Laboratory at the Royal Naval College, Greenwich, describes his experiments

to produce such a concentrated form of an anti-scorbutic though, of course, as a result of recent discoveries, he worked with lemon instead of lime-juice.

The mention of the laboratories at Greenwich recalls the fact that in 1827 Sir William Burnett made arrangements for instruction to be given to medical officers in the Navy, but it was not until 1881 that a school was started at Haslar Hospital where, amongst other things, courses were instituted in naval and general hygiene. In 1900 the study of tropical diseases was included, and gradually other additions and improvements were made. Finally, in 1912 the school was moved to Greenwich, so that it might be more in touch with the great teaching centres in London. Hence, although for a time the part played by the Medical Department of the Royal Navy was not so conspicuous as that filled by the Army Medical Service, so far as what may be called "Imperial Medicine" is concerned, yet of late years the Navy has come into its own in this direction although, owing to changes in the political world, it is no longer in touch with the tropics on such a scale as was formerly the case. Thus its hygienic problems have tended to become specialised. Yet great progress has been made in many ways, and we need merely cite the stamping out of undulant fever in the Mediterranean Fleet and the highly successful control of venereal disease to indicate that the Navy in its sleepless watch upon the seas does not forget to watch also those forces of disease and death which in the olden days played such havoc with its personnel.

THE MERCANTILE MARINE

If, in those olden days, the Navy suffered so severely from insanitary conditions and disease, it is not surprising to find that the state of the Merchant Service was even more deplorable. The marvel is that men could be found willing to serve at sea in those times, for though possibly their surroundings were, all things considered, not much worse than those they experienced in low haunts ashore, yet their food was often unfit for consumption, and usually incompatible with the preservation of health. Still the Mercantile Marine also had its pioneers. Captain, afterwards Sir James, Lancaster, who in 1600 was commodore of a fleet belonging to the East India Company, together with a surgeon, Ralphe Slater by name, tackled a scurvy outbreak on their vessel,

the *Dragon*, and by administering lemon-juice, as did Hawkins at the Azores in 1590, and attending to sanitation, saved a large moiety of the ship's company. Lancaster had profited by sad experience, for his adventurous voyage to Malaya in 1591 had ended disastrously owing to scurvy. At Penang in 1592 he buried twenty-six of his unfortunate crew.

Very quaint is the diction of John Woodall, a surgeon of the East India Company, in his book, *The Surgeon's Mate*, which appeared in 1617. "The juyce of Lemmons is a precious medicine and well tried, being sound and good, let it have the chiefe place, for it will deserve it, the use whereof is: It is to be taken each morning two or three spoonfulls, and fast after it two hours, and if you add one spoonfull of Aquavitæ thereto to a cold stomach, it is the better. Also, if you take a little thereof at night it is good to mix therewith some sugar, or to take the syrup thereof is not amisse. . . . *In want thereof*, use the juyce of Limes, Oranges or Citrons, or the pulp of Tamarinds." These were early days, when the great merchants had time to think of the welfare of their crews and used them compassionately, supplying anti-scorbutics and seeing that their vessels were well found in all respects. At a later date "the cares of this world and the deceitfulness of riches" played a part in the neglect which supervened.

The mention of tamarinds recalls advice given to the Army surgeon, Dr. John Bell, at a much later period by a certain Captain Thomas Forrest, a shipmaster of repute, who took a lively interest in questions of food preservation. He descanted on the value of fish in the dietary, and advocated a Portuguese practice of cutting up fish in small slices and preserving them in a mixture of salt and sugared tamarinds. The same seafarer pointed out that salted meat could be prepared for the table only by boiling and that, therefore, there was great monotony in the diet. He found that slices might with advantage be preserved in a mixture of salt and raw sugar, bone being left out, as salt will not penetrate it and it soon decays. He considered tea of value in the way of weaning men from the use of strong liquor. Bell himself took much interest in the question of salt provisions, though more from the military point of view, and he refers to experiments by the Earl of Dundonald, who invented a process for purifying sea-salt which largely consisted in the addition to it of vegetable acid.

Sad to say, however, the annals of the Merchant Service

are not brightened like those of the Navy by the achievements of notable hygienists. Speaking generally, its sanitary record has been deplorable, and even at the present time much remains to be done. Yet the appearance in 1911 of such a book as *Ships' Hygiene* by Melville-Davison, the Medical Superintendent of the Booth Steamship Company, Limited, and still more the publication in 1920 of Brooke's admirable *Marine Hygiene and Sanitation* should aid the cause.

In practice the Americans would seem to have outstripped us, as was indicated in the suggestive reports of the special commissioner of the *Lancet* which appeared in 1920-21, and some of which have been embodied in a timely little book called *Merchant Seamen*, written by Home, a fleet surgeon of the Royal Navy. To this work the reader is referred, for space does not permit a full consideration of the subject here, and in any case there is little of moment to relate. The urgent need of reform is clearly indicated.

The hygiene of the Mercantile Marine cannot be left in the hands of the Board of Trade, although it is true that the Board not long since issued revised instructions as to the Survey of Masters' and Crew Spaces on Ships and that these mark an advance on those of 1913. It should be the duty of the Ministry of Health to safeguard the lives of our seamen and to force shipowners to improve conditions usually faulty and not infrequently bad in the extreme. As Home says, "That Navy which is not backed by a sound Merchant Service has feet of clay." Health lies at the very root of soundness. Some of the old and tragic mutinies in the Navy were occasioned in part by the wretched hygienic conditions under which the men served, and it is a disgrace that the sanitary state of our Mercantile Marine should, apart from some notable exceptions, continue a blot upon our escutcheon. The treatment accorded our sailors has already had serious effects. They cannot well mutiny, but they can and do desert a service which has few attractions for decent men. It only remains to say that such improvements as have been effected are due to individuals like Collingridge, once Medical Officer of Health of the Port of London, to other health officers backed by the Royal Sanitary Institute, to a few scientists like Armand Ruffer and Willmore, who drew attention to the water supplies of ships, to a public-spirited journal like the *Lancet*, and to certain naval officers, notably Sir Robert Hill, Admiral Somerville, and the authors of the above-mentioned works who, shocked by what they have seen on

some of our merchant vessels, have put pen to paper in an effort to get matters remedied. Amongst other advances may be noted the important decision of the National Council for Combating Venereal Disease, which in its report for the year ending June 1921, advocates putting down with an iron hand the admission of prostitutes to ships in harbour. This is a matter of great importance, and it is satisfactory to know that attention has at last been directed to it.

CHAPTER III

THE ARMY

THERE are a few instances of the British Navy's having failed in its objectives owing to the crippling effects of sickness. Such calamities, however, are more in evidence in the history of the land forces of the Crown. Time and again the Army has experienced veritable disasters owing to lack of knowledge, or lack of foresight, or lack of both. Moreover, it is sad to think that infinitely more might have been accomplished in both services had hygienic measures only been rated at their proper value, and that thousands upon thousands of lives have been lost and a vast treasure has been thrown away for the selfsame reason. It is true that the lesson has at last been learned and that practice has justified precept, but catastrophe is an expensive teacher and there is much to regret and much that can never be condoned. At the same time it would be a mistake to suppose that the blame rested wholly or even chiefly with the individual medical officer or the individual regimental officer. Apart from an outstanding personage like Sir John Pringle, it is clear from a study of the literature that a considerable number of medical officers serving in the Army took the greatest interest in methods for the preservation of the health of the troops under their care. Quite a number wrote on the subject, especially towards the end of the eighteenth century, and, considering the state of knowledge in their day, wrote ably. To cite only a few: Cleghorn published his *Observations on Epidemical Diseases in Minorca* (1744-1749), Brocklesby dealt with hospital hygiene in 1764, and Monro wrote on *The Means of Preserving the Health of Soldiers* (1780). Of these the last-named book possesses much of value. Monro was obviously the literary child of Lind, but he was himself a man with much experience, and his work is of a very practical nature. It is surprising to find how much was really known in his day as regards camp sanitation. His remarks on privies, pit latrines, the purification of drinking-water, camp hygiene generally, and measures against jail fever (doubtless both typhus and relapsing fever) have a wonderfully

modern air about them. Nowadays it is the fashion for lecturers on hygiene to cite Moses and quote his sanitary precepts in Leviticus. In all probability it was Monro who introduced this custom, for he reminds his readers of the instructions issued by the Patriarch. Monro's forgotten volume certainly merits the attention of the student of Army hygiene.

We may also mention the book by John Bell, published in 1791, entitled *An Inquiry into the Causes which Produce and the Means of Preventing Disease among British Officers, Soldiers, and Others in the West Indies*, the works of Hunter, Moseley, and Rollo, likewise dealing with this part of the Empire, and those of Wright, who discoursed about both the Eastern and Western Hemispheres. Quite recently Bourke, in a paper on "The Medical Aspect of an Eighteenth Century Battalion," gave interesting extracts from a book written by a regimental officer, Bennett Cuthbertson, in 1768, which show that at that period and certainly for some time previously considerable attention was paid both by commissioned and non-commissioned officers to the health and welfare of the British private. Indeed Bourke remarks, as a result of studying this volume, that "Military sanitation was by no means so neglected as many modern sanitarians imply when referring in tones of contempt to bygone times." It should, however, be noted that by 1768 the influence of Sir John Pringle (1707-1782), must have been making itself felt, and that in any case, the real cause of much of the trouble has to be looked for beyond and above, not only the individual battalion, but the Army itself. What was true of the Navy was true of the Army. Those in high places were chiefly to blame, and this has more or less been the case from the days when a standing army first came into being to those which witnessed the scandal of Mesopotamia and the heart-breaking conditions in East Africa.

In this brief survey it is unnecessary to go beyond the days of Pringle. For one thing, prior to his time, the Army can scarcely be considered as serving a far-flung Empire; for another, until he laid its foundations, military hygiene can hardly be said to have existed.

Pringle gained his experience during the campaigns of 1742-5 in and about Flanders and in Great Britain. His great work, *Observations on the Diseases of the Army*, was first published in 1752, and has been described by Sir John Simon, himself the writer of a classic, as one of the classics

of medicine. Pringle was distinguished for his sound common sense and practical recommendations as regards the prevention of sickness. He went so far as to suggest that foul straw and privies may have played a part in the causation of dysentery, and he pleaded earnestly for fresh air and cleanliness. He wrote on fevers, more especially typhus, and discoursed also on autumnal fevers, a term doubtless including both malaria and fevers of the enteric group. He correlated the different forms of dysentery and named influenza. He was Surgeon-General from 1742 to 1758, but the influence of his writings was not confined to military circles. It extended to the Navy and to civil life, and jails and mines as well as barracks benefited by his observations and persistence. He found a worthy follower in a Scottish compatriot, Robert Jackson (1750-1827), concerning whom Dr. Crummer of Omaha has recently written in so full and interesting a manner, but Jackson, a masterful man, did not hesitate to controvert Pringle's opinions when he considered that they were erroneous or not sufficiently well founded. He practised in Jamaica, there getting into touch with the British Army, which he afterwards joined at New York. He served in America, Flanders, and the West Indies, was keenly interested in yellow fever and other febrile complaints, and wrote a treatise on the fevers of Jamaica which contains hints on the means of preserving the health of soldiers in hot climates. Quite apart, however, from this and his other book on fevers, Jackson deserves to be remembered for his advanced views on the organisation of the Medical Department of the Army, views which brought him into violent collision with the authorities, but which he stoutly, not to say firmly, upheld, and which he had the satisfaction of seeing adopted after the disastrous Walcheren Expedition. The management, or rather mismanagement, of affairs was then taken out of the hands of the tripartite board consisting of a Surgeon-General, a Physician-General, and an Inspector-General of Hospitals, and the department was placed under the control of a Director-General with three principal assistants, a most important change which soon justified its adoption.

It was high time something was done. Within a very short space of years 90,000 British troops had perished in the West Indies, almost all from disease due, in no small measure, to ignorance and culpable neglect. In 1809 Walcheren, where nearly 30,000 officers and men were attacked by fever, had accounted for a mortality of 3469.



From a Cartoon of the period (1809.)



From a Cartoon of the period (1809.)

per 1000 of strength of troops. Even the patient populace was becoming alarmed and disgusted at these military holocausts. As has usually happened in our island story, the need produced the man required, and Dr. (afterwards Sir James) McGrigor, the first Director-General of the Army Medical Department, stepped into the breach. He was yet another of those hard-headed Scots whose natural ability and devotion to duty had brought them to the front. Moreover, he had profited greatly by a very varied experience both at home and abroad. He did not enter upon his high office until his active soldiering was at an end, but he had been through the mill in Flanders, Walcheren, the East and West Indies, Egypt and the Peninsula, as well as at home, and had proved his mettle. Firm yet friendly, quick-tempered but of a kindly nature, honest and fearless in the discharge of his duties, with a very proper Highland pride and a great spirit of camaraderie, McGrigor is an engaging figure, and he breathed the breath of life into an effete and discredited organisation. Once again it was war which quickened the dry bones, and once again the long and deadening years of peace sapped the soundness of the fabric which had been reared, and in some measure brought about the shame and miseries of the Crimea. Here a mortality of 230 per 1000 of the strength showed how very little progress, so far as field conditions were concerned, had really been made in Army hygiene, and dysentery and cholera claimed their victims wholesale. But, as previously stated, a great change had already been wrought in England, thanks to Chadwick and his disciples, so that these preventable horrors of war could no longer pass unnoticed, or be regarded as inevitable. The Press, whose influence in matters hygienic has perhaps never been fully appreciated, made the public aware of what was happening, and Florence Nightingale, though chiefly concerned with the hospitals and with nursing, drew attention to the state of affairs which had led to her remarkable interference in a domain hitherto peculiar to the other sex. Her denunciations, her personal efforts, her determination, and the friendships she formed as the result of her plunge into publicity, together with the support accorded her by the high-minded Sidney Herbert, resulted in the commission bearing his name which issued its far-seeing report in 1858. Sir John Goodwin in his Chadwick Lectures for 1920 aptly described this report as an illuminating document. The pity is that all its provisions were not carried into effect. Happily

that concerned with the spacing out of barracks became operative and thereby achieved much in the way of reducing the incidence of tuberculosis and other "contact" diseases. Two of its suggestions are well worth noting here: the establishment of an Army Medical School at Netley and the creation of an Advisory Board on Hygiene.

Although there was again a groping towards better things, the Army, or rather a part of it, clad in most unsuitable raiment, had to pass through the furnace of the Indian Mutiny, while in every part of the tropics where its units were stationed, the losses from sickness and death were grievously high.

Take, for example, even the case of Mauritius, for many years the seat of a large garrison and prior to the great malaria outbreak of 1867-8 considered rather a healthy station than otherwise. Andrew Davidson, who wrote much on tropical medicine and hygiene in pre-Manson days, supplies the following information:—

Table showing Death-Rate of the Troops stationed in Mauritius from 1823-1862 inclusive, in successive periods of ten years.

1823-1832	..	..	..	26	per 1000
1833-1842	..	..	..	30	" "
1843-1852	..	..	..	20.67	" "
1853-1862	..	..	..	24	" "

Two things were chiefly required, organisation and education. The work of the Herbert Commission improved both in some degree, but in days when steam was only gradually replacing sail power it was not easy to exercise control in countries far from the centre of things, and we were still lamentably ignorant of the causes of many, indeed of most, tropical diseases. Hence progress was more in the direction of treatment than of prevention, and hygiene continued to be the Cinderella of the Medical Services. This, however, was true rather of its practical application in the field and elsewhere, for its importance to the Army had by this time been eloquently preached both by Martin, the second edition (1861) of whose work, already mentioned, contains an admirable chapter on "The Prevention of Disease," and by Edmund Parkes, a great hygienist whose *Manual of Practical Hygiene prepared especially for use in the Medical Service of the Army*, appeared in 1864, and by 1873 had reached a fourth edition. The fifth edition was edited by de Chaumont,

who himself wrote on public health subjects, and the names of Parkes and de Chaumont remained for a long time household words in the realm of preventive medicine. Still, even so late as the Afghan War (1878-80), a campaign conducted in a region not notoriously unhealthy, there was a mortality of 93.7 per 1000.

The most notable incident abroad during the decennium following 1880 was the discovery by Bruce in 1887 that Malta (Mediterranean or Undulant) Fever was due to the *Micrococcus melitensis*. The success of his work indicated what opportunities for valuable research awaited the trained Army Medical Officer, while the discovery itself was one of great and far-reaching importance, though many years were to elapse before its full value was to become apparent. Hughes, a fellow-officer of much promise, who fell at Colenso, confirmed Bruce's work and made a careful study of the disease.

At home things were distinctly improving, as indeed was to be expected, for the Army had one great advantage over the civilian population. It possessed not only a health organisation but discipline to enforce the King's Regulations. Discipline combined with increasing knowledge rendered our numerous smaller campaigns much less expensive in wastage of men, and by the time we essayed to reclaim the Sudan from savagery, efficiency had reached such a point that the disease and accident mortality amongst British troops amounted only to 36.18 per 1000 of average annual strength (Taylor). Of this, however, 23.65 represented deaths due to enteric fever, and 4.56 to dysentery.

But it was one thing to preserve the health and fighting efficiency of a comparatively small force composed almost entirely of regular troops and quite another to safeguard from communicable disease a large mixed army operating under difficult conditions over a long period of time. The South African War of 1899-1902 taught us a bitter, if salutary, lesson. It demonstrated our weakness in the field, and revealed the fact that not only was our sanitary organisation woefully defective in certain respects, but that it was hopeless to expect good results until officers and men in all branches of the service had received instruction in preventive measures, and until a co-ordination had been effected between the Medical Services and the rest of the Army. Such co-ordination was most urgently required between the doctors and the engineers, and it was apparent that the Royal Engineers had to play their part in the sanitary campaign. Nevertheless,

as Goodwin puts it, "South Africa saw the dawn of scientific study of disease as regards its actual incidence in the field." Not only so, but it witnessed the practical application of that study. Almroth Wright and his assistants, notably Semple, had not laboured in vain at Netley.

As early as 1897 Wright's anti-typhoid vaccine had been tested on a large scale at Barming Heath Asylum. Thereafter it was tried in India during 1898-9, when 4000 soldiers were inoculated, with favourable results. Then came the war, during the course of which 100,000 men received a measure of protection. We speak advisedly, for in those days the paratyphoid fevers, against which inoculation with a typhoid vaccine alone affords little, if any, protection, had not been differentiated. Moreover, in these early days the question of dosage was still in an experimental stage, and the method of preparation had not been perfected. Even so the results were encouraging, and it was clear that a new agent of great prophylactic value had been discovered.

Yet in the South African campaign no fewer than 57,684 cases of typhoid occurred, of which 19,545 (33 per cent.) were invalided, and 8022 (13.9 per cent.) died. Contrast this last figure with that of those killed in action—only about 7000 all told. No one who has seen the long lines of graves in Bloemfontein Cemetery can fail to be impressed and saddened by the ravages of disease in war. Typhoid played the major part, but dysentery, that scourge of armies, also accounted for much invaliding and many deaths, and in those days, apart from attention to field sanitation and the care of food, there was no means of preventing this disorder. Indeed its true nature was not generally recognised. In most instances medical officers did not know whether they were dealing with the amœbic or the bacillary form. Yet as the war progressed, scientific measures were adopted to grapple with the problems that arose. First and foremost the microscope was brought into use—an instrument infinitely more valuable than the stethoscope during a campaign like that in South Africa. One of us can recall how a certain civilian medical officer, or rather civil surgeon, was regarded somewhat as a crank because he had armed himself with a microscope and was wont to incubate culture tubes inside his pyjamas!

And yet, prior to the war, Bruce had shown the value of a microscope in Zululand when in the nagana disease of cattle he had found the trypanosome which bears his name. All, however, did not possess his scientific acumen and

enthusiasm, and the number of microscopes with the South African Field Force could be counted without much difficulty.

It is not so much its introduction for ordinary clinical use at the base hospitals and elsewhere to which we refer, but its employment for scientific purposes, as at General Headquarters at Pretoria, where a laboratory under Captain (now Major-General) W. W. O. Beveridge was established. This institution functioned both as a hygienic and a bacteriological laboratory, and in addition to much routine blood testing and examination of pathological material carried out research in several directions, notably in connection with tinned foods.

Moreover, a commission appointed in September, 1900, toured the country and investigated more especially the nature of the dysentery which had accounted for so much loss. This commission, on which served Bruce, Notter, and Simpson, the last-named a civilian and formerly Medical Officer of Health of Calcutta, found that the prevalent type was bacillary, a discovery which served to place treatment on a sounder basis. It was in connection with this commission that the laboratory was established at Pretoria. By the close of the campaign our knowledge had certainly been increased in several directions, and useful indications were forthcoming as to future progress.

The quickening influence of the war, the interest taken in the matter by St. John Brodrick, afterwards Lord Midleton, and the representations of Sir Alfred Keogh, who became Director-General of the Army Medical Service in 1904, resulted in the removal of the Army Medical School from Netley to London, where it was placed in touch with other scientific institutions and the great hospitals of the metropolis. Its new teaching and research laboratories, together with its fine library were in every way worthy of the cause they served, and once again new life was breathed into a service which in some directions had lagged behind the times. For example, educational facilities had been deficient, and there had been no proper scheme for keeping the personnel up to the mark during their whole course of service. All this was changed, and the Royal Army Medical Corps became a living force and began to attract the best men from the schools of medicine.

Its fame was spread by further research work at home and abroad. From the imperial point of view the discovery by Leishman of the causative agent of Kala-azar, or, as it is now called, Leishmaniasis, was an event of great importance,

though the method of transmission of its protozoal parasite baffled and still evades inquiry. Bruce with his assistants added fresh laurels to his name and gained fresh glory for his corps by his work on African sleeping sickness, while naval, military, and civil members were united in a commission appointed in 1904 by the Royal Society to investigate Mediterranean, or, as it is now called, Undulant Fever, with a view to its elimination. Naturally Bruce headed this commission, which contained men with names now well known in the realms of hygiene; Shaw of the Navy, Horrocks of the Army, Zammit of Malta, Eyre of Guy's Hospital, and many others, while Bassett-Smith played a prominent part in the research work. It is a matter of history that this commission established the association of the fever with goats, and that, as a result of its work, the disease was virtually banished from the Mediterranean Fleet and from the garrisons of Gibraltar and Malta.

This period, that is, the earlier years of the present century, was one of great activity in the way of literary output. Horrocks made an important contribution to the bacteriological examination of waters; Notter and Firth enlarged and improved their standard work on the *Theory and Practice of Hygiene*, which was indeed the lineal descendant of the book by Parkes and de Chaumont; Caldwell, Beveridge, Wanhill, and Melville all wrote on sanitary matters, especially with reference to military life.

Important researches were conducted by Melville and Dunbar Walker on the hygiene of the march, and by Beveridge and Melville on the food of the soldier.

Laboratories were established at centres both at home and abroad, and systematic research along various lines soon yielded results which were to prove their value in the day of trial.

Special sanitary officers with trained men under them made their appearance. A school of sanitation was started at Aldershot. Instruction in hygiene for cadets was instituted at the Staff Colleges, both at Camberley and in India, while so long ago as 1905 King's Regulations laid it down that it is the duty of commanding officers to ensure the care and cleanliness of their camps and that theirs is the responsibility.

It is impossible to detail all the activities of a period of steady progress, but a glance at certain statistics quoted by Sir John Goodwin will reveal the effect of proceeding along sound scientific lines. He gives a comparison of figures relating to the sickness and mortality rates per thousand of men serving among European troops in India.

	CONSTANTLY				
	SICK.	DEATHS.	MALARIA.	DYSENTERY.	CHOLERA.
1878-1882	68.1	20.5	569	42.8	5.7 (4.2 deaths).
1912	28.8	4.6	82	5.2	0.3 (0.2 ,,).

Such small expeditions as took place in the ten years following the great Boer War also demonstrated that the Army had got a grip of first principles, and was, in most cases, able to grapple disease with a knowledge that spelt success.

Hence, when Germany threw down the gage of battle and Europe was convulsed by the mightiest conflict the world has ever seen, the Medical Services of the Army were able to face with confidence and equanimity the demands made upon them, especially as power was given them to enlist the services of civilian specialists and the rank and file of the profession throughout the Empire. That confidence was more than justified so far as the long front in France and Flanders was concerned. In this war area hygiene, using the word in its widest sense, attained a veritable triumph. Nothing like it had ever been witnessed, just as there had never been anything to parallel the measures taken to safeguard the health of the fighting men and to protect the lines of communication from foes as deadly as, and more insidious than, those who strove to reach the Channel.

Here it is possible only to outline in the briefest way the multifarious activities of the Army hygienists. Anti-typhoid inoculation was carried out on a huge scale, and the mere preparation of the supplies of vaccine was an arduous undertaking. At first the single typhoid vaccine containing only *B. typhosus* was employed, but as a result of the numerous paratyphoid infections occurring in the Mediterranean war area, and more especially at Mudros and Gallipoli, the triple or T.A.B. vaccine containing not only the typhoid bacillus but the closely related Paratyphoid A and Paratyphoid B bacilli was introduced. The results were in the highest degree satisfactory. Leishman, who has played a great part in connection with the introduction of anti-typhoid inoculation and the collection and collation of statistics, expounded these of a lecture which he delivered in Glasgow early in 1921 and which will be found in the *Journal of the Royal Army Medical Corps* for July of that year. Here, however, we give the latest figures available, those listed by Torrens in his contribution to the medical history of the war.

ENTERIC GROUP OF FEVERS.

Comparative Statistics amongst Protected and Unprotected Men.

Theatre of War.	Year	Disease.	Incidence per 1000.		Death rate per 1000.		Case Mortality per 1000.		No. of Cases.	
			Protected.	Unprotected.	Protected.	Unprotected.	Protected.	Unprotected.	Protected.	Unprotected.
France ..	1914	Typhoid ..	—	—	—	—	5·8	17·3	51	202
		Para. A. ..	—	—	—	—	—	—	—	5
		Para. B. ..	—	—	—	—	—	3·2	—	31
	1915	Typhoid ..	·93	8·1	·07	1·8	7·5	23·2	517	288
		Para. A. ..	—	·4	—	·003	—	·7	—	281
		Para. B. ..	—	1·7	—	·03	—	1·9	—	1043
	1916	Typhoid	·57	·51	·009	·04	1·58	8·33	693	36
		Para. A. ..	·21	3·19	·003	·05	1·56	1·78	256	224
		Para. B. ..	·3	9·2	·002	·07	·82	·77	362	647
	1917	Typhoid ..	·104	1·09	·008	·13	7·7	12·12	194	33
		Para. A. ..	·07	1·12	·000	·03	—	2·93	139	34
		Para. B. ..	·18	4·14	·003	·13	1·7	3·20	346	125
	1918	Typhoid ..	·02	·19	·003	·04	13·84	24·00	65	25
		Para. A. ..	·01	·04	·000	—	2·7	—	37	6
		Para. B. ..	·05	·22	·000	—	·78	—	127	29

As regards these returns it should be noted that the triple vaccine did not come into routine use until January, 1916, and that subsequent to this date re-inoculation was enforced after an interval of from eighteen months to two years. It will be seen that the increase in the case mortality of typhoid fever in 1917 and 1918 occurred in both protected and unprotected. Hence it was probably due to other factors than the adoption of the triple vaccine. Even had the latter been the cause its use would have been amply justified by the much lower incidence of all three types of enteric infections in protected persons.

Doubtless the unremitting attention paid to general sanitation, including the detection and segregation of "carrier" cases, played a part, on some fronts a great part, in conferring immunity against the enteric group of fevers, but, even at their best, sanitary measures in the field in time of war cannot attain anything like perfection, and there can be no shadow of doubt that the protection afforded by inoculation is a most important factor in preserving the troops from typhoid fever and its allies. Vaccination against small-pox was made compulsory, and the value of the Jennerian method was once again vindicated; the horrors of tetanus were wellnigh eliminated by the prophylactic use of anti-tetanic serum, and in certain war areas cholera and plague were kept in check by their respective vaccines. Not only so, but in the case of the enteric fevers and of cholera the virulence of the disease when acquired was notably reduced by these scientific methods.

Means were adopted to purify water supplies, more especially by means of chlorination, and war was everywhere waged against the disease-carrying fly. Other types of vermin, and particularly the loathly louse, known to be the vector of the virus of typhus fever and relapsing fever, and proved during this war to convey the unknown organism of trench fever, a new disease differentiated and classified while hostilities still raged, were destroyed on a large scale. Huge disinfection centres were created and new means of freeing clothing and bedding from lice and the skin mites which produce scabies were devised. The rôle of dirt in spreading disease and sapping *moral* was recognised and washing and cleansing arrangements on a scale without precedent were put into operation. The sullage water from bath-houses and kitchens was purified and a wonderful fat-saving campaign was instituted whereby the grease and soap from such sullage became

available as glycerine. There was also much saving of solder from food-containing tins while, like the Israelites of old, the sanitary sections made bricks without straw and thereby effected many economies. Much ingenuity was displayed in dealing with excreta and refuse. Horse litter was prevented from becoming a nursery for flies by various methods, some of them employed for the first time.

Food-stuffs, supplied in a variety and quantity surpassing the dreams of the most optimistic of commissariat officers, were protected from contamination and prepared for consumption under hygienic surroundings. Not only so, but as far as possible they were consumed under cleanly conditions. Schools of cookery were instituted; personal hygiene, even to the daily use of the tooth-brush, was enforced. The teeth themselves were not neglected; dental units were formed and much dentistry was carried out. Education was not forgotten. Schools of sanitation were at work in the United Kingdom, and sanitary demonstration centres made their appearance upon every front.

Billets were subject to sanitary discipline, and outbreaks of influenza and cerebrospinal fever directed attention to the subject of droplet infection and the striking-distance of these maladies. As a result the requirements for lateral space, as distinguished from cubic space, and for adequate ventilation in barracks and hospitals were placed upon a sounder basis. Laboratories of all kinds sprang into existence and mobile hygiene laboratories moved hither and thither, helping the sanitarian to scotch disease at the outset.

In short, a war was waged within a war, and, largely as a result, the war-producing war terminated in victory.

Yet in certain areas a heavy price was paid, and this price was exacted partly because the difficulties to be overcome were peculiar and of such magnitude that it was well-nigh impossible to cope with them successfully, partly because there was delay in getting the preventive machinery to work, partly through ignorance and lack of driving power, and partly because the right men were not sent to the right places, and because the claims and problems of some of the distant theatres of war were not fully recognised.

Thus malaria wrecked a fine army in Macedonia, chiefly on account of local conditions which stultified if they did not paralyse every effort, save perhaps one, made to defeat it. That one consisted in the evacuation of the infected men

and was not put into force until all other measures had to a large extent proved futile.

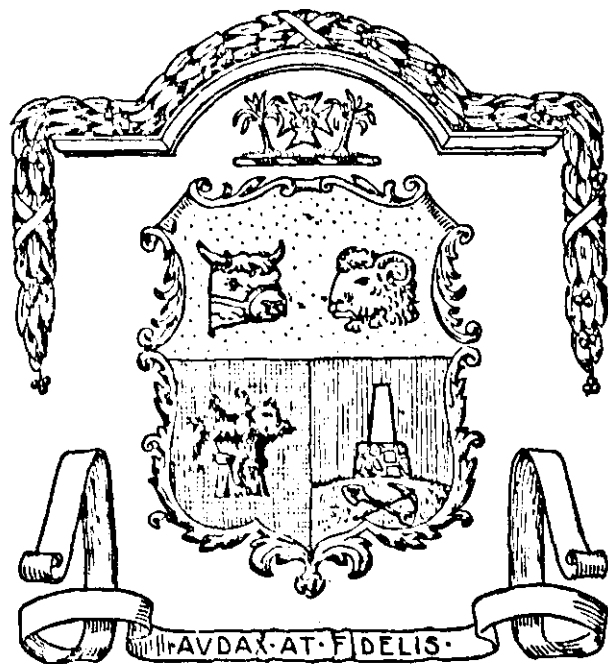
Thus in Mesopotamia there was at first a tragedy, happily followed by a most wonderful and glorious recovery when a great outcry had forced attention to be directed to a neglected campaign and the conduct of affairs passed into the hands of trained and skilled officials.

Thus East Africa will ever be remembered as a spot where, though much was done in certain directions, the climate and the general environment combined with lack of timely aid and other more complex factors to bring high hopes to naught and wellnigh to ruin a most difficult and dangerous undertaking.

Still, when all is said, the world war proved how marvellous had been the advances made in the science and application of hygiene, and justified to the hilt the long and careful preparation of those responsible for the health of the Army. It demonstrated also in no uncertain fashion how military hygiene is now bound up with that of civilian life, and how immeasurably improved is the position of the general population so far as sanitary education is concerned. Perhaps the most remarkable thing about it was the way it furthered the cause of research and spread a knowledge of what may be called the imperial diseases, those wide-spread maladies which in time of peace militate against progress and development within the Empire. It is also astonishing to think how hygiene came, as it were, into its own during such a time of stress and strain. Doubtless the old causes—fear and discomfort—were still operative, but over and above these factors there was something higher and greater, a recognition of all that the science of Health means to a community both in peace and in war, not only in the way of preventing sickness and saving life, but as an elevating and purifying force ensuring that *mens sana in corpore sano* without which there is neither soundness nor content. It is assuredly safe to say that no one could have predicted that at the close of hostilities no fewer than 17,000 officers and men would be enrolled in the sanitary service of the military forces of the Crown.

As was inevitable, there has been some slackening off since the war came to an end, and in certain directions the future of the Medical Services of the Army gives rise to apprehension. So far, however, as hygiene is concerned, the immediate future seems assured. A Directorate of Hygiene has been created and its programme of work has been laid down.

It appears that the chief military problems are concerned with the control of physical training, the prevention of skin affections, the spacing out in barracks and on transports, and the improvement of the "domestic" condition of troops and their families, for, as Sir John Goodwin reminded his hearers, there are some 13,000 women and 25,000 children to be considered. The immediate aims of the directorate are the maintenance and improvement of the sanitary instincts of the troops and the betterment of the scientific knowledge of officers, both in the hygienic service and in the corps generally. The provision of trained specialists in tropical medicine and other branches requires attention, and it is important to maintain and extend the relation now existing between the preventive medical service of the Army and that of the civil community. In all these directions, as well as in its everyday life, the Army will play its part in preserving and improving the public health of the Empire as a whole.



Queensland.

CHAPTER IV

THE OVERSEAS POSSESSIONS

I.—THE NEW WORLD

IF one considers the age and magnitude of the British Empire, the diversity of the units of which it is composed, and the rapidity with which certain portions of it have developed within recent times, it must be apparent that, in a comparatively small book of this kind, it is quite impossible to deal in anything like an adequate manner with the progress and problems of public health in our overseas possessions. All that can be attempted is a series of sketches, a rapid review of the hygienic history of the great self-governing dominions, of the Indian Empire, and of certain of the Crown Colonies and Protectorates, concentrating attention, where this is feasible, on such questions as have a truly imperial significance.

Happily in the case of the West Indies the ground has already been traversed to a great extent by Sir Rubert Boyce, whose account of health, progress, and administration in these old colonies remains the standard work on the subject.

In the early days of the Empire these same West Indies bulked largely, and so long ago as 1657 Richard Ligon, Gent., published his *True and Exact History of the Island of Barbadoes*, which he wrote while in an English prison. His book was the outcome of a visit paid to the colony in 1647-8, and contains some very pregnant remarks on health questions. He happened to be there when a terrible epidemic of yellow fever was decimating the community. This was the outbreak mentioned by Schomburgk in his *History of Barbadoes* (1847) and Ligon gives a graphic, if short, account of the scenes he witnessed. He was obviously an observant gentleman possessed of the "sanitary eye," for he discourses severely on Bridgetown as follows:—

"A Town ill situate, for if they had considered health, as they did conveniency, they would never have set it there; or,

if they had any intention at first, to have built a Town there, they could not have been so improvident, as not to foresee the main inconveniences that must ensue, by making choice of so unhealthy a place to live in, for their convenience being near the harbour. But the main oversight was to build their Town upon so unwholesome a place. For the ground being somewhat lower within the Land than the Sea-baulks are, the Spring-Tides flow over and there remaine, making a great part of that flat a kinde of Bog or Morast, which vents out so loathsome a savour, as cannot but breed ill blood and is (no doubt) the occasion of much sickness to those that live there."

More than two centuries were to pass before Barbados was to be free from yellow fever visitations, and even now, despite a piped water-supply, *Stegomyia fasciata*,¹ the mosquito vector of the parasite of "Yellow Jack," still flourishes in the island.

There is perhaps more to be gathered about the early days in Jamaica concerning which Mary Gaunt has written so charmingly in her *Where the Twain Meet*. This is partly because Sir Hans Sloane sojourned for a year (1687-8) in the young colony when physician to the Duke of Albemarle, and Hans Sloane was a very acquisitive and observant person filled with a great enthusiasm for science and as diligent as he was curious. His mighty book in two portly volumes makes capital reading and his quaint introduction is replete with observations upon the public health. His style may be exemplified by the following passage: "The most common Drink is Water. 'Tis reckoned the most wholesome Drink by many, amongst whom I am one." But while we may smile at his pomposity there is much sound sense in his observations on climate, water-supply, housing, clothing, food, and so forth. He kept a very complete meteorological record during his stay on the island, and he has much to say about the diseases he saw and the patients he treated. The impression conveyed is that he was much better as sanitarian than as doctor. He noted, as others did after him, how rats were a common article of diet amongst the negroes, and he records the feeding of slaves on shipboard with earth-nuts; he mentions also the use of mosquito-nets.

An even earlier record is that of Thomas Trapham, M.D., who at Port Royal wrote a quaint and pious little book which was published in 1679 under the title of *A Discourse of the*

¹ Now more correctly known as *Aedes aegypti*.

State of Health in the Island of Jamaica. Though it cannot be compared with Sloane's mighty compilation its author was evidently imbued with a good deal of hygienic acumen. He points out that in the tropics "punishment of all Intemperances affords less time for Repentance," and he inveighs strongly against the sophistication of wines, notably "Canaries, Sacks, and balderdashed Clarrets." He raises a veritable pæan of praise in favour of "Chocalata," which he terms an "Ambrosian Nectar," and he writes wisely on questions of diet, praising the island fruits, descanting on Callepee and its nutritive value, and giving quite a good list of the local sea-fishes suitable for food. His chapters on the diseases of the island are not so useful, but he describes what he called "Dropsie" or the "Country Disease" in a way which suggests ancylostomiasis. Curiously enough, he believed that mosquito eggs swallowed in drinking-water hatched into small worms in the stomach!

One gathers that the settlers in those days, at least the wealthier planters, too often washed themselves by their copious libations into graves which they had dug with their own teeth. As Lady Nugent says when writing at a much later period: "They (the planters) eat like cormorants, and drink like porpoises." There was a great deal of debauchery and few had any idea of adapting their mode of life to their tropical environment. There was doubtless much truth in Leslie's statement that "the general Complaint which is made of the Unhealthiness of this Place is founded upon a perfect Mistake. If Newcomers would preserve a due Regimen and live temperately they might be as happy here as anywhere in the World."

At the same time there is evidence to show that both in the seventeenth and eighteenth centuries Europeans in Jamaica and the other West Indian islands had not learned to make use of those amenities of life which the more trying climate of Eastern India and possibly also the presence there of a special type of native had led the Anglo-Indian to adopt.

As Dr. James Johnson put it in 1813:—

"With respect to officers and other genteel classes of society, on landing in the western world they are destitute of many powerful shields which are pretty generally interposed between Europeans in the East and the burning climate. In the former case we may look in vain for the palankeen, the budgerow, the punkah, the tatty, and the light, elegant, and cool vestments

of India, together with the numerous retinue of domestics, anticipating every wish and performing every office that may save the exertion of their employers. The untravelled cynic may designate these luxuries by the contemptuous epithet of 'Asiatic effeminacy'; but the medical philosopher will be disposed to regard them as rational enjoyments or rather salutary precautions rendered necessary by the great difference between a temperate and torrid zone. Nor are these *dulcia vitæ* the exclusive property of the higher classes in India. The European soldier is permitted to intermarry with the native Hindustanee nymph; and, whether married or not, he has generally a domiciliated *chère amie*, who cooks, washes, and performs every menial drudgery for massa, in health, besides becoming an invaluable nurse when he is overtaken by sickness."

Yet both in East India and the West Indies there was very little attempt at general sanitation. It was probably Hans Sloane who remarked that "Were it not for the John Crows (small vultures, known in Trinidad as Corbeaux) towns in Jamaica would not be habitable." This was true of many of the other islands; the vulture, the pig, the pariah dog were the scavengers, and the first-named was protected. Leslie, already quoted, who knew Jamaica about the beginning of the eighteenth century, gives rather a gloomy account of the white inhabitants, stating that "the people seem all sickly, their complexions muddy, their colour wan, and their bodies meagre, they look like so many corpses and their dress resembles a shroud." On the other hand, he speaks of Kingston having been well planned and built after the earthquake of 1692 which destroyed Port Royal. It would also appear that even in those days there was some sanitary legislation, for there were building laws for Port Royal and an enactment against the adulteration of rum. Moreover, it was laid down that each plantation must have one acre of ground well planted with provisions for every five negroes it employed.

There was no radical change for many a long year. Lewis, a West Indian proprietor, who was in Jamaica in 1815-16, and again in 1817, refers to the ravages of tetanus neonatorum on his estate, a disease to which Renny had previously drawn attention, but on the whole he took a cheerful view and says "the dreaded mosquitoes are not worse than gnats." Considering the gnat and the mosquito are the same insect this finding was to be expected.

Somewhat later Phillippo, a Baptist missionary, in a dull book, comments on the filth of the negroes, many of whom, he says, eat cane-rats, cats, putrid fish, and decomposing animals and reptiles.

The conditions in the other islands closely resembled those in Jamaica, save perhaps that the latter, being wealthier, was rather more advanced in the matter of public buildings and private homes. At the same time it would be a mistake to suppose that no one was enlightened and that no efforts were made towards better things. A certain Dr. James Grainger, who died in St. Kitts in 1767, wrote learnedly and well on the diseases of negroes, even distinguishing, as Ballingall did later in India, two distinct kinds of dysentery. He inveighed against the neglect of providing the slaves with proper clothing and food, describing it as the worst species of prodigality as well as highly inhuman. He was opposed to monotony in food, and was far in advance of his day as regards the question of "Sick Houses," as he terms estate hospitals. He gives good directions and plans for these, and actually pleads for the provision of isolation and venereal wards.

These few extracts and details must suffice to convey a general idea of the sanitary conditions prevailing. The better classes were comfortably housed, if uncomfortably clad; the male members of the community as a rule overate, over-drunk, and were given to venery; there were poor whites and bondsmen who dragged out miserable existences; the slaves were occasionally well looked after, but too often neglected, while the lower classes amongst the free coloured population had wretched habitations, were badly fed and existed amid foul surroundings. The towns, even if well planned, were dirty and doubtless full of flies and vermin. There was much ill-health, and the bills of mortality were high. Every now and then devastating outbreaks of yellow fever swept through the island communities, causing terror and dismay, and leaving behind them many graves and much sorrow, misery, and poverty. Epidemics of malaria came and went, small-pox occasionally flared out, slaying hundreds and pitting those who survived. Slowly the importance of the West Indies declined. The cessation of the wars with France, the abolition of slavery, the lowering, and later the abandonment, of the differential duty between West Indian sugar and slave-grown sugar about the middle of last century, and more especially the inception on a

considerable scale of beetroot cultivation in Europe, associated with the bounty system, all served to undermine their prosperity and finally to bring them wellnigh to ruin.

Naturally under such conditions there was not much money to spare for sanitation, though some of the islands, turning from sugar to other commodities, achieved a fair measure of prosperity, and thus were able to pay some attention to hygiene. There was great need to do so, for the emancipation of the slaves introduced fresh problems of housing and feeding, and at a later date the importation of East India labour, together with the influx of Chinese, raised all kinds of questions in the sanitary development of colonies like Trinidad, British Guiana, and Jamaica. We cannot linger longer over these earlier days, still less give an account of the hygienic history of each island separately or of British Guiana, whose fortunes are more or less bound up with those of the islands, but passing mention should at least be made of the excellent work accomplished in Port-of-Spain, which has been rendered a fine, clean and healthy town, virtually cleared of mosquitoes, and which at the present time does credit to British sanitary administration.

Here and there fruitful research work has been carried out in laboratories, though there is a great paucity of these useful institutions. We may cite the elucidation of the cause of Vomiting Sickness in Jamaica, the plague work conducted in Trinidad, and the ancylostome inquiries of Nicholls and Branch in several of the smaller islands.¹

It is, we think, more important to direct attention to such concerted action as has been taken by the West Indian colonies, and more especially to the quickening in matters hygienic which is now taking place, and which may yet have far-reaching results.

In 1888 there was held in Demerara a conference on quarantine with a view to the adoption of a uniform system.

There have been other attempts at mutual help and co-operation, which were badly needed, for, as regards the smaller islands at least, it may with truth be said that theirs was a case of "out of sight, out of mind." Their medical and

¹ An interesting résumé of the scientific work published by medical men in British Guiana from 1769 to the present time has recently been written by Rose and Chow.—*Vide British Guiana Medical Annual*, 1923.

sanitary interests have undoubtedly been much neglected and there has been a great deal of discontent, which has had its inevitable effect on the work accomplished. Yet amongst much that is disheartening the success of the campaign against yaws in Grenada is a matter for satisfaction, as is the interest taken in the problem of infantile mortality both by medical men and laymen, or rather laywomen, in British Guiana, St. Kitts, Barbados, Jamaica, and Trinidad, and what has been done to combat tuberculosis in several of the colonies. These and other questions are discussed in the valuable report drawn up by the Hon. E. F. L. Wood, M.P., late Parliamentary Under-Secretary of State for the Colonies, as a result of a visit he paid to the West Indies and British Guiana, December, 1921 to February, 1922. Therein he drew attention to the excellent results achieved by the activities of the Rockefeller foundation in the hookworm campaign which it instituted, thereby setting an example to the world of concerted sanitary action on a large scale. As Major Wood says: "Wherever the doctors of this institution have been at work, solid results have been achieved, but experience shows that, unless their work is energetically followed up and maintained by the permanent authorities, all that has been gained is soon lost, and the old enemies recapture the ground that has been wrested from them."

This visit of the Parliamentary Secretary of State was an important step in advance. It gave that personal touch which is so desirable, and aroused fresh hopes and aspirations.

But prior to Major Wood's inquiry an important conference had been held at Georgetown, British Guiana, at which delegates were present from Demerara, Trinidad, Jamaica, Barbados, Grenada, St. Lucia, and also from the London School of Tropical Medicine. In addition to interesting scientific discussions this conference considered the question of general hygienic progress in the West Indies, and forwarded twenty-three important resolutions to the Secretary of State.

These have been summarised in an excellent article on "The British West Indies Medical Services," by Dr. G. B. Mason, which appeared in *United Empire* for November, 1922. The list is here reproduced, for some of the measures advocated are applicable to many other parts of the British Empire, and show that the local medical officers are fully alive to the steps which must be taken to improve conditions,

vastly different, it is true, from those obtaining half a century ago, but which, in certain directions, still remain highly unsatisfactory and call urgently for remedy.

1. The introduction of the most modern methods of promoting infant welfare, personal and public sanitation, and hygiene.

2. In the interests of the health of an immigrant population in the West Indies, the provision of a pure water supply, efficient surface and soil drainage, a properly organised system of disposal of refuse and excreta, efficient control of mosquitoes, and stringent enforcement of public health ordinances and regulations.

3. The West Indian Governments :—

(i) To instruct the agricultural departments to promote the rearing of small live stock by the labourers, to provide a suitable proportion of animal proteins for their daily dietary ; (ii) To introduce educational propaganda in the schools to promote a knowledge of food values ; (iii) To consider the question of subsidising local food industries, such as fishing, etc., and the relaxation of duties on imported protein foodstuffs.

4. That a survey of individuals in various districts of different colonies be undertaken to obtain information concerning local racial factors which result in poor physique and industrial inefficiency.

5. That a system of control of midwives be established, including methods of training, registration, and supervision by a central authority.

6. The registration of still-births, and confidential notification of miscarriages in connection with measures for infant welfare.

7. To the West Indian Governments, the adoption of school medical inspection as a routine procedure.

8. To the West Indian Governments, the need of restrictive measures for venereal diseases, to include educational propaganda, and the provision of free and confidential treatment at existing institutions.

9. That alastrim be regarded as small-pox, and that research as to its nature be undertaken.

10. Revaccination of the population.

11. The following measures of malaria control :—

(i) The strict enforcement of anti-mosquito ordinances ;
(ii) Special attention to be paid to the value of the screening of houses and institutions, and the general use of mosquito netting.

12. That the diagnosis of yellow fever be based on clinical signs and symptoms, until the accurate diagnosis by laboratory

methods be discovered, and that there be no relaxation of anti-mosquito measures.

13. That lepers be isolated after notification, and that arrested cases of leprosy be not discharged from leper asylums under any conditions.

14. The provision of a supply of anti-tetanic, anti-dysenteric, and other sera and vaccines.

15. The establishment of a United West Indian Medical Service.

16. The adoption by other colonies of the recent leave regulations of British Guiana.

17. The early appointment of a Sanitary Commissioner for the West Indies, to be under the Imperial Government, and independent of local control.

18. The provision of an adequate whole-time staff for the Government Bacteriological Laboratory.

19. That the training of medical staffs in the schools of tropical medicine be compulsory for all officers before entry into the Colonial Service.

20. That all officers already in the service should take such a course, and be provided with free transport, full pay, and study leave to enable them to take it.

21. The publication and circulation of a medical magazine.

22. That the Colonial Office invite the London School of Tropical Medicine to undertake research in the West Indies, and that the Colonial Governments secure local support for the specialists sent.

23. That a West Indian Medical Conference be held every three years.

Thanks in a large measure to the efforts of Dr. Mason, a "West India Welfare Society" has recently been established. It is charged with the duty of trying to reduce the existing sacrifice of infant life in the British West Indies, and will also concern itself with promoting generally the welfare of that portion of the Empire. It has secured the sympathy of the Colonial Office, and its aims and the necessity for its activity are well set forth in the above-mentioned paper by Dr. Mason. From the Blue Books of 1920-21 he has prepared an interesting comparative statement which we reproduce.

It will be seen that it includes figures relating to Bermuda and British Honduras which, though not properly classed as West Indian possessions, are yet closely connected with the latter.

A Comparative Statement of the Population, Total Trade and Revenue, the amount spent on Medical Services, the Birth Rate, Death Rate, and rate of Infantile Mortality of Bermuda, the British West Indies, British Guiana and British Honduras, compiled from the latest Blue Books, 1920-21.

COLONY.	Area in Square Miles.	Population		Density—No. per Square Mile in 1921.	Total Trade, 1920-21.	Total Revenue, 1920-21.	Total Spent on Medical and Allied Services.	Percent. of Revenue Spent on Medical Services.	Birth-rate.	Death-rate.	Rate of Infantile Mortality
		Census, 1911.	Census, 1921.								
Bermuda	19.5	†22,700	†20,137	1,033	£ 1,680,118	£ 219,753	£ 9,750	4.44	†28.06	†17.10	140
British Guiana ..	90,300	296,041	297,691	3.29	1,322,484	1,270,675	120,018	9.44	31.9	25.6	148
British Honduras	8,598	40,458	45,317	5.27	2,427,196	251,096	21,215	8.45	45.03	25	123.04
Bahamas	4,404	55,944	53,031	12.04	1,363,832	254,019	23,421	9.22	34.4	21.6	—
Jamaica	4,207	831,383	857,921	203.92	17,459,292	2,332,635	164,023	6.99	40.8	25.3	172.51
Turk's and Caicos	169	5,615	5,612	33.21	104,245	11,294					
Cayman Is. ..	89	5,564	5,253	59.6	15,925,593	1,917,743	161,925	8.44	29.85	23.76	174.93
Trinidad	1,754	312,803	339,402	193.5							
Tobago	114	20,749	23,378	205	10,011,317	454,284	44,623	9.82	29.68	26.44	270
Barbados	166	171,983	150,312	941.64	1,234,500	134,128	24,595	18.33	34.86	17.5	115
Grenada	120	66,750	59,198	493.32							
Carriacou	13	66,750	7,104	546.46	556,880	59,221	10,630	17.95	36.99	18.66	105
St. Vincent ..	133		38,372	49,899								375.2
Grenadines ..	17	3,505	4,115	242	983,416	99,147	14,131	14.25	36.7	18.9	143
St. Lucia	233	48,637	51,505	221							
Dominica	305	33,863	37,059	121.5	517,808	59,219	7,415	12.52	41.12	27.62	146
Antigua	108	31,394	28,804	267.26	1,226,916	106,893	20,124	18.82	34.56	34.11	233.24
Barbuda	62	871	903	14.56							
Montserrat ..	32.5	12,106	12,120	373	318,735	19,622	1,982	10.10	41.14	23.24	133.93
St. Kitts	65	26,283	22,415	345							
Nevis	50	12,945	11,569	231.38	1,332,481	106,750	14,319	13.41	37.97	46.02	322
Anguilla	35	4,075	4,230	121							
Virgin Islands ..	58	5,502	5,082	87.62	67,515	11,715	780	6.74	51.90	25.36	43
Totals, ..	111,052	2,047,003	2,008,117		66,532,328	6,900,919	639,115				

† These figures for Bermuda give a misleading impression owing to the fact that they include the floating Hotel population and the Naval and Military establishments which vary in strength. The actual figures for the Permanent Civil Population are: 1911, 18,904; 1921, 20,127. The birth rate for this population in 1921 was 31.2 per 1000, and the death rate 18.17 per 1000. As regards birth-rates and death-rates in the Leeward and Windward Islands the figures are not strictly comparable owing to a lack of uniformity in registering still births and other details.

In the West Indies, as elsewhere, one of the most important points in prosecuting a sanitary policy is to see that due provision is made for the practical application of existing knowledge. It is here that the trained sanitary inspector plays so useful a rôle, and fortunately Trinidad set an example in providing facilities for the instruction of local inspectors. Not only so, but the Royal Sanitary Institute has now appointed a board of examiners for sanitary inspectors in Barbados, Trinidad, and British Guiana. Speaking generally, it may be said that wherever active steps have been taken they have, save in the case of the hookworm campaign, been largely limited to urban areas. It is, however, essential more especially in the larger and more important islands, to extend the sanitary warfare to the rural districts and to take the control of sanitation out of the hands of inefficient local boards.

Dr. Mason concludes his observations with some very sound remarks. He quotes Professor Wynne of Sheffield as saying that the chief cause of communal disease is poverty which is increased by waste and excessive taxation. "In the West Indies," he continues, "it is sounder policy to establish a service of district nurses, welfare workers, and health visitors to educate the people in hygiene than to spend large sums on hospitals to treat the sick." We would modify another of his paragraphs to read as follows: "It is better to clear away slums and swamps than to spend money on the treatment of tuberculosis, hookworm disease, or malaria." Finally, we would endorse, as he does, Professor Wynne's statements that the mere saving of child life is not enough, as an end, unless we make these lives worth living, and that it is little use preaching conventional morality to people for whom marriage has been made a practical impossibility by the promotion of poverty and the failure to provide economic housing.

So far as the sugar-growing islands are concerned, the Great War brought about an unexampled period of prosperity, and though the tide has ebbed in some degree there can be no doubt that the economic resources of the more important West Indian Colonies justify a considerable expansion in matters hygienic. If only this can be pursued along sound lines there is no reason why these possessions, so rich in historical memories, in beauty and in fruitfulness, should not also become renowned for their salubrity, and thereby regain in some measure the proud position they were wont to hold as outposts of the Empire.

Canada.—On our way northwards to Canada it would have been interesting, had space permitted, to consider the development of public health in what was once a part of the British Empire, but now forms a portion of the Great Republic of the West; those groups of eastern states which by force of arms seceded from the British Commonwealth. It is in some ways an interesting story from the time of the early English and Scottish settlements down to the period when allegiance to the Crown was renounced, and it is remarkable that maritime quarantine was enforced in the American colonies before it was adopted in England. The first Quarantine Act was passed by the General Assembly of Pennsylvania in 1700, and was quaintly entitled "An Act to Prevent Sickly Vessels coming into this Government." At the same time it was not, of course, until long after the Declaration of Independence that there was any real quickening in public health matters. The recent remarkable sanitary development of the United States is a matter of history and will be found ably set forth in the volume entitled *A Half Century of Public Health*, edited by Ravenel and published under the auspices of the American Public Health Association.

One is inclined to wonder if in process of time it will be possible for any one to write, say for New Jersey, in terms somewhat similar to those employed by a certain Charles Gordon, who in the year 1685 wrote to a Dr. John Gordon, Doctor of Medicine at Montrose in Scotland, from Woodbridge, East Jersey, as follows:—

"I find it wholesome, for I am not (blessed be God) troubled with Defluitions, headakes, and coughs, as at Edinburgh, which is a great inducement for me or any valetudinarian man to stay in this Country; people come from Barbadoes to York and hither for their health sake. . . . If you design to come hither yourself you may come as a Planter or a Merchant, but, as a Doctor of Medicine I cannot advise you, for I can hear of no diseases here to cure, but some Agues and some cutted legs and fingers, and there are no wants of Empericks for these already; I confess you could doe more than any yet in America, being versed both in Chirurgery and Pharmacie; for here are abundance of curious Herbs, Shrubs, and Trees, no doubt Medicinall ones for making of drugs, but there is little or no Employment this way."

But the British Empire is so vast that we cannot linger over early days in what is now the United States, and indeed

can only briefly consider the history of hygiene in Canada. The country became British in 1763. Under the old French régime there had been considerable sanitary activity and several useful laws had been passed dealing more especially with questions regarding the hygiene of food, but for thirty years after Wolfe's victory on the Heights of Quebec, hygiene appears to have fallen into oblivion; at any rate there is no mention of it until the year 1795 when, as recorded by Lachapelle in his *Progress of Sanitation in Canada*, the occurrence of typhus fever in Ireland led to the imposition of quarantine on all vessels coming from infected ports. From 1815 to 1821 the government appointed Medical Vaccinators, granted prizes for a memoir on the advantageousness of vaccination and encouraged its practice, although it did not make it compulsory. Previously inoculation for small-pox had been in vogue, having been introduced by an army surgeon, Mr. Lathom, in 1768. The care of the public health in Canada may be said to have begun in 1819, when a medical board was established, but it was not till 1832 that there was any definite enactment relating to the formation of Boards of Health. Public health history, like other history, has a way of repeating itself, and it is not surprising to find that a certain sanitary activity which was displayed in 1832 was occasioned by a bad outbreak of cholera. As in England, so in Canada, fear was one of the main forces directing attention to the necessity of safeguarding the public health, and it led to the founding of a well-organised quarantine station at Grosse Isle, near Quebec, the place where the present great quarantine station is situated. As usual, however, once the danger was past there was considerable retrogression. So far as Toronto was concerned, it required a cholera outbreak in 1834 before the Medical Board directed the attention of the mayor, aldermen, and commonalty to "the most deplorable state of filth and uncleanness" which existed in the city. At a somewhat later period the same board is to be found advocating cleanliness and construction of public sewers. At the same time it is significant that in 1839 when recommendations were put forward for a Medical School in Toronto no mention was made of public health, nor even in 1850 when the Trinity College Medical School was founded. Yet a further epidemic of cholera had occurred in 1849. It would appear that in the early days in Canada both remittent and intermittent fevers were frequent amongst the Indians at Newark (Niagara), while in the late thirties of

last century the troops in Upper Canada suffered considerably from intermittent fever. In those days the land to the east of Toronto was still marshy, and much of the country was in a condition favourable to the breeding out of anophelines.

So late as the early eighties of last century we find an inquiry afoot regarding malaria in the province of Victoria, a commission gravely considering the ætiological significance of collections of sawdust from a sawmill on a river bank, and a Professor of Pathology testing its effects on experimental animals.

Scurvy was at times prevalent, more especially when the potato-rot was present, while, generally speaking, most of the communicable diseases found in temperate climates occurred, at least in the larger towns.

In 1868 the British North America Act securing the Confederation of the Provinces of Canada became law. It laid down in a definite form the respective duties and responsibilities of the Dominion Federal Government and the governments of the various provinces; the arrangements then made hold good at the present time. All health matters relating to foreign countries and to commerce are considered to be federal in nature. Hence the Federal Government controls immigration and quarantine, prevention of contagious diseases in animals, food adulteration, and statistics. The various Provincial Governments exercise jurisdiction over all local sanitary matters. Superior, or, as they are sometimes called, Provincial Boards of Health, were established and placed on a sound footing, and they still function. They have formulated and passed much useful health legislation, modelled for the most part on the English Public Health Act of 1875. This great measure had a quickening influence outside Great Britain, and we find Bowditch of Canada, who delivered the centennial discourse on Public Hygiene before the International Medical Congress of 1876, declaring categorically that "Public hygiene is the most important matter any community can discuss, for, upon it, in its perfection, depend all the powers, moral, intellectual, and physical of the State."

A Canadian Public Health Act was passed in 1882. This and subsequent Acts, for each province has its own, together with By-laws, savour very strongly of the old Public Health Act of 1875, but they are more condensed. There has been continued progress since these comparatively early days and more especially during the last twenty years, but, no doubt

owing to the vastness of the territory and as a result of political development, the conditions in Canada in one respect at least differ markedly from those obtaining in England. The duties and jurisdiction of the Federal Minister of Health at Ottawa are circumscribed for the several Provincial Governments, most of which possess their own Ministers of Public Health, and permanent staffs of public health officials are jealous of their own powers and resent interference by the federal authorities. The scope of the latter is therefore limited to matters which affect more than one province, or the whole of Canada. In addition to the duties above mentioned, the Federal Health Minister controls sanitation as it affects railways, camps, the Indians and their reserves, and such public health activities as are concerned with more than one province, as, for example, the prevention of venereal disease, pollution of water, provincial waterways, and so forth.

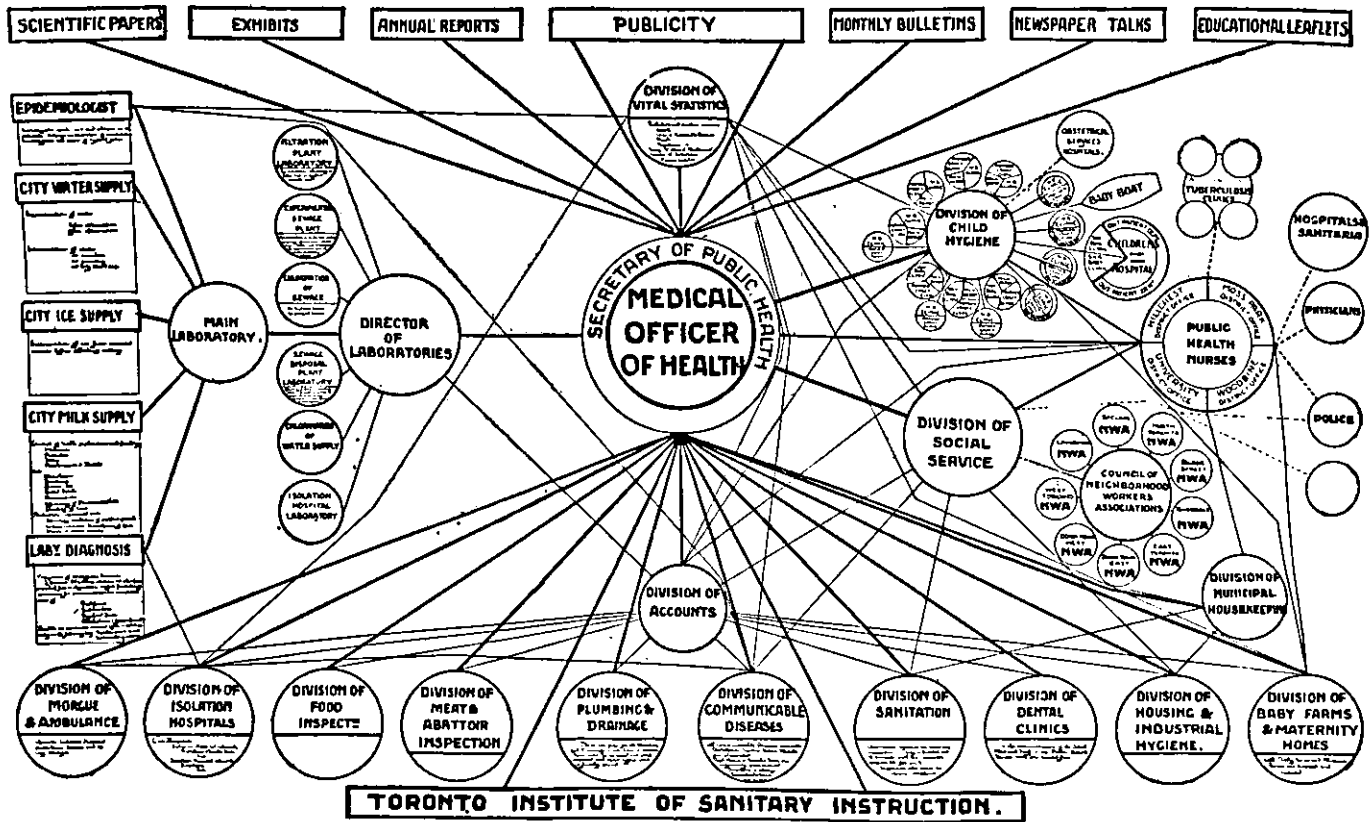
Such an arrangement may lead to somewhat curious situations. Thus in the case of animals slaughtered for food if the meat is to be consumed within the province, only the Provincial Health Officers are concerned. If, however, the meat is intended for export to another province or abroad, the Federal Officers assume control of the meat inspection. Apparently, despite such arrangements, the scheme as a whole functions in a fairly satisfactory manner. Professor Starkey of McGill University likens the administration in the provinces to what obtained in England when the local Government Board was to the fore. Each province is to be regarded as a separate country with its own Parliament, and each Provincial Board of Health, now replaced by a Minister of Health, corresponds to the vanished Local Government Board of England.

In the large towns there are now, as a rule, qualified Medical Officers of Health with sanitary staffs and powers and duties resembling those of similar officials in England. In smaller places local medical men combine health duties with practice, a bad arrangement which is slowly being eliminated.

Naturally there is still much requiring improvement in Canada and that chronic complaint, lack of funds for the betterment of public health conditions, is in evidence there as elsewhere. At the same time the country as a whole has adopted what may be called the health tradition. Climatic conditions are, generally speaking, favourable to the maintenance of a high standard, at least so far as most of the

DIAGRAM OF ORGANIZATION

DEPARTMENT OF PUBLIC HEALTH CITY OF TORONTO.



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From a paper by Dr. Charles J. Hastings which appeared in the *American Journal of Public Health*, Vol. 6, No. 2.

common communicable diseases are concerned, and the great Dominion has followed worthily in the footsteps of the mother country, and has doubtless benefited to some extent from the proximity of the United States, where a certain idealism in sanitary matters is combined with much technical ingenuity. Canada, however, does not play second fiddle to any country in public health affairs. She has developed on broad and sound lines, and has recognised the imperial nature of her responsibilities by the establishment of a Chair of Tropical Parasitology in her great University at Montreal. Not only so, but at the Western University, London, Ontario, there is actually a Faculty of Public Health, so that sanitary science is here given a very exalted position.

In her cities, towns, and long-settled regions hygiene is as advanced as, and perhaps in certain places and in some particulars more advanced than, in corresponding spots in England, where rural sanitation not infrequently has remained in a very backward condition. Very remarkable has been the recent sanitary development of Toronto (vide graph) and one of its most pleasing and encouraging features is the spirit of co-operation and helpfulness which prevails amongst all interested in hygiene. This is specially noticeable in the relations between the University and the City Health Department, and has contributed greatly to the public weal. Vast tracts yet await development in Canada, but the sanitary sense is not lacking, and it may be taken for granted that necessary hygienic measures will proceed *pari passu* with the reclaiming of virgin soil, with the growth of communal life, and the expansion of the nation.

2.—THE DARK CONTINENT

British West Africa.—From a medical standpoint the West Coast possessions possibly form the brightest jewels in the diadem of Crown colonies. When one remembers the dread in which the West Coast was held not so very long ago, when one recalls its synonym—the white man's grave—an appellation only too well merited, and when one sees what has been accomplished there since this century began, there certainly appears to be a measure of truth in the above statement.

Some people may regard it as savouring of hyperbole, others may be tempted to say "the best of a bad lot," and

yet others, aware of manifold imperfections, may laugh it to scorn, but if they will only sit down and seriously study the hygienic history of this group of colonies they will, we think, be forced to admit that the simile is justified.

It would take far too long to trace minutely the development of each of the territories which go to make up British West Africa, so we propose merely to take a series of glimpses at them, sufficient to reveal their sanitary state at different periods, and then to consider a little more in detail the events which led to the revolution which has occurred since 1902, and the nature and significance of the change affected.

Sierra Leone is the oldest of the colonies, and owes its origin to the philanthropist Granville Sharp and his scheme for settling on the African West Coast freed negro slaves from Nova Scotia. This free settlement, a mixture of Europeans and persons of colour, began in 1787, and paid the usual penalty for its rashness. It was nearly annihilated by disease at the outset. Even at a somewhat later period, namely in 1792, the health conditions were bad. Thus almost one-half of the Europeans living ashore died during the rainy season and nearly one-tenth of the Nova Scotians. It is interesting to note, especially in the light of Lind's recommendations (see p. 34), that many of the company's servants resided on the *York*, a ship of 850 tons. This refuge from malaria was, however, eventually destroyed by fire. By 1784 things had improved, notably as the result of the clearance of land and the building of good houses.

Indeed we find the botanist, Mr. Afzelius, fairly cheerful in 1793. He writes that—

“The climate is very unlike that of Europe, but by no means bad, much less dangerous than many imagine. . . . However, with a good constitution, prudent diet, guarding against sun and rain, and, in case of indisposition, immediately using efficacious remedies, suppressing all strong passions such as chagrin, discontent, etc. (for in hot climates the mind appears to have a stronger influence over the body than in cold) there is no doubt but that you may live as long, as well and as happy here as in Europe, having good houses, conveniences, etc.”

This recalls Leslie's remarks on Jamaica, and is much in accordance with what the Rev. Thomas Eyre Poole had to say on the subject about the middle of the last century. Prior to the French invasion in 1794, we find Mr. Afzelius again writing in a hopeful strain :—

"I thrive now much better at Sierra Leone than I did before. Indeed not only myself but the whole colony begins now to flourish under our sensible leaders. Its advancement during my absence is astonishing. We have now a regular town of at least 200 houses, some of them very decent, but, as yet, the streets are somewhat obstructed by the roots of trees. The land is cleared of wood for several miles around the town, and in many places cultivated, which has rendered the climate so salubrious that, at this moment (May 11th), there is not one sick in the whole colony, consisting of 1400 persons, and the deaths during my absence did not amount to twenty."

As a matter of fact the settlement seems to have been comparatively prosperous and healthy when handed over to the Crown in 1808, but there was a bad epidemic, probably of yellow fever, in 1823.

A Commission of Inquiry into the state of the settlement was held in 1810 and it is instructive to read the remarks regarding the medical department.

"The importance of this branch of the establishment in a tropical climate is so obvious that it is unnecessary to dwell upon it at length. The provisions for this department, in a recent parliamentary vote, were a first and second surgeon, an apothecary and his assistants; and were these offices filled up in a suitable way they might have been sufficient to effect their purpose but such is the proportion of the salaries to the efficiency and ability required in the officers, that no competent person could be found to accept the first two posts."

Contrast this state of matters with that now obtaining whereby Sierra Leone can boast a director, medical and sanitary service; a deputy director, sanitary service; a deputy director, medical service; two senior medical officers, and nine medical officers.

The early history of all the colonies resembled in certain particulars that of Sierra Leone. The old forts, the slave stations, and the trading settlements bequeathed an evil inheritance. Read the quaint *New and Accurate Description of the Coast of Guinea* by the Dutchman, William Bosman, published in 1705, wherein he comments on insanitary conditions and "noysome stenches."

Again, take the Gambia, where Bathurst was established in 1816. An unfortunate settlement took place on Bulam Island, at the mouth of the Rio Grande. It was ruined by an outbreak of fever, the nature of which cannot now be

determined. On the Isles de Los a military force also perished from disease. An account of these disasters is given by James Boyle, who was a colonial surgeon in Sierra Leone during 1822-23, and later served in the Navy. He deals with the whole west coast, and comments especially on the scandalous condition of Cape Coast Town. Unfortunately even to-day this place has an evil reputation.

So far as fever outbreaks are concerned, a great deal of information will be found in the four reports of the Yellow Fever Commission, of which one of the present authors was latterly a member. These reports appeared between 1913 and 1916, and to them the reader is referred for many interesting historical and other details which cannot be here considered, but which show how woefully fever-ridden the whole coast used to be. It is altogether a sad business, a record of wrecked expeditions and a constant struggle with disease, a struggle in which man was sadly handicapped by lack of knowledge. Take McWilliam's account of the medical history of an expedition to the Niger during the years 1841-2. Here the crews of three vessels were decimated by fever and the enterprise had to be abandoned. The seriousness of the situation from the economic standpoint was fully recognised. Thus Dr. William F. Daniell in the preface to his *Sketches of the Medical Topography and Native Diseases of the Gulf of Guinea*, published in 1849, wrote as follows:—

“ A glance at the mercantile relations of Great Britain with this portion of Africa will show how extensive and important the connection has become, especially since the commencement of the present century. Were it not for the fatal insalubrity of climate, so deleterious to the European constitution where life is not forfeited at once, it is impossible to say what extent our commercial intercourse would have acquired with the inland regions of the vast continent of Africa which lie at this moment unexplored and unknown.”

It seems a pity that the author of this passage is not alive to see the enormous change which has taken place, largely because the insalubrity of climate of which he speaks has been proved to be, in some degree, a misnomer, the chief culprit being the mosquito in one form or another, while our knowledge of preventive measures generally has been revolutionised.

The year 1862 was a specially bad one so far as yellow fever is concerned, and perhaps about this time and for some

years afterwards the reputation of the coast as a death-dealing spot was at its worst. At any rate here is what Dr. James A. B. Horton wrote in 1867 :—

“ Not only has the European on leaving home a melancholy foreboding of a speedy termination of his existence but his relatives and friends also reckon him, from the day of his embarkation as amongst the dead ; and to what extent these forebodings have been realised I leave the death-rate of the few Europeans who visit the coast to tell.”

It is a pity this somewhat gloomy medical officer could not also be resurrected and see what has been accomplished, for he was a pioneer who in 1866 urged the necessity of sanitary reform and, as he says, “ was harshly remarked upon by many of those whose lives it was my chief object to spare.” In his time conditions must have become very bad in Sierra Leone. He refers to the appalling state of Freetown, to which the epithets of “ a Golgotha and a Gehenna ” had been applied, and furnishes some information about the Gambia. Presumably as a result of his efforts the local government of Sierra Leone promulgated an ordinance for establishing a Board of Health.

These few sketches culled at hazard must serve to give some idea of the sanitary state of possessions which were for the most part sadly neglected and regarded more as a nuisance than anything else. As early as 1827 there had been an open policy of scuttle, and it was advocated periodically and supported by references to the waste of life and the hopelessness of overcoming the unhealthiness of the settlements.

So we come at length to that remarkable woman, Mary Kingsley. Down to her day, and that was not very long ago, for her *West African Studies* appeared as recently as 1899, things had not very greatly altered. Champion of the coast and its possibilities as she became, she was yet forced to deplore that great drawback—its unhealthiness—from which she felt there was no escape, though she comments caustically on the bad living conditions and observes sadly that “ no trouble is taken to pull the death-rate down by Science.” Most significant is her dismal quotation from the *Lagos Standard* for September 7th, 1898 :—

“ There is no doubt that something should be done to relieve the men (grave-diggers) from the strain of work to which they are continuously subjected. The demands of a constantly increasing death-rate which has caused the cemeteries to be enlarged, make it necessary that the number of grave-diggers

should be increased. No holidays. At it from 6 a.m. to 6 p.m. every day, Sundays included, for the Grim Reaper is ever busy."

Miss Kingsley contrasted the conditions obtaining in the Crown colonies with those existing in Nigeria under the Royal Niger Company, and her comparison was greatly to the advantage of the latter. She also insisted on the importance of the West Coast colonies from the economic standpoint, showing how they possessed products of the utmost value for the markets of the United Kingdom, and she deplored the apathy with which they were regarded and the neglect to which they had been subjected.

Her book appeared at the right time, for Joseph Chamberlain was Colonial Secretary and Manson had succeeded in exciting his interest in Ross's work. Chamberlain was certainly impressed with the necessity of doing something to abate the fever on the dreaded coast, and attention gradually became focused on that part of the world. It assuredly possesses one advantage in that officials are constantly coming home on leave. There are always two streams of men on Government service, one coming from and one going to these colonies, which are at no great distance. Hence the permanent officials at the Colonial Office are kept more closely in touch with our West Coast possessions than with any other of the Crown colonies. This is a great matter, for there is no truer proverb than "Out of sight, out of mind." Moreover, about the time with which we are dealing, Mr. (afterwards Sir) Alfred Jones and other financial magnates had their eyes very much upon the West Coast, so that everything, as it were, worked together for good up to a certain point. The real quickening came in 1899 when, as described in his *Memoirs*, Ross started off for Sierra Leone to complete the work at which he had laboured for years in India. He quickly succeeded in proving that *Anopheles costalis* was a vector of human malaria; and indicated the measures necessary for its suppression. He was followed by Stephens and Christophers, who did much pioneer work on mosquitoes. Hope ran high, and there was much enthusiasm, for in those days the full magnitude of the problem of malaria prevention by destruction of the mosquito was scarcely appreciated. Still there can be no doubt that this visit and the scientific work carried out by Ross and his colleagues in Sierra Leone laid the foundation of the great organisation which was soon to be built up. Another factor was the establishment of the London and Liverpool Schools of Tropical Medicine, to which

reference has already been made. The leaven of science, however, works slowly in this conservative world, and more than a year later conditions were so unsatisfactory that, as Ross states, "Our African merchants were becoming less and less pleased with African sanitation or rather insanitation, and their dissatisfaction culminated in a deputation to Mr. Joseph Chamberlain in March, 1901."

According to Ross, both the Colonial Office and the West African Governments were to blame. In March, 1901, he drew up a programme of the principal sanitary reforms required for West Africa. It included elementary items of town management, proper sanitary regulations, and, above all, a sanitary commissioner to inspect regularly down the coast and report to the Colonial Office. This last provision he terms an absolute essential, and all those who possess an intimate knowledge of the subject will whole-heartedly agree with him. Sad to say this essential, has not been realised to this day though, as we shall see, the services of Professor Simpson were in due course requisitioned. Ross's account of the deputation to the Colonial Secretary makes amusing but disheartening reading, and it presents Chamberlain more in the light of a calculating politician than of a great man alive to the necessities of the situation and the responsibilities of his high post. It was private enterprise and philanthropy that enabled Ross again to visit the West Coast and to undertake at Freetown, with the help of the local authorities, the campaign on which his heart was set. He then proceeded to Lagos, where, happily for him, one of the finest and most enlightened of colonial administrators was the Governor. In Sir William MacGregor, a scientist as well as an administrator, he found a powerful ally, and he was fortunate also at Accra, where Major (now Sir) Matthew Nathan was in command. Daniels, of the London School of Tropical Medicine, followed Ross and so the ball was set rolling. Its pace has varied, but it has never ceased to roll, though it would seem, judging from Ross's *Memoirs*, that the Colonial Office of those days did its best to check it. The earlier work was carried out by men he left behind him on the coast, and they were encouraged by the reports of the American yellow fever campaign in Havana. It is doubtless true that the much maligned Colonial Office was slow to move, but the fact remains that in 1902 the West African Medical Service came into being. Prior to this date isolated medical men had been appointed by government, but the losses amongst them

were heavy and there was a dearth of candidates for appointment, a deficiency aggravated by the South African War. A committee of which Mr. (now Sir) Herbert J. Read was chairman reported in December, 1901, on a scheme for the amalgamation of the Medical Services in the West African colonies and protectorates. Its proposals, well conceived and well presented, were adopted and since that time there has been no looking back. It is impossible here to trace step by step the various developments which have followed this important initial action. From comparatively small beginnings the service has grown to large dimensions. At the present time more than 160 medical officers are employed. Yet what are these amongst the huge native population? As Hollenbeck, who was a member of the Phelps-Stokes Commission in 1921, affirms, there is still an utter inadequacy of the medical force for the work that urgently needs to be done, an inadequacy affecting both personnel and equipment. Still a distinct sanitary service has been created, laboratories which function as research institutes have been established, there are specialists in several departments, and the whole situation has radically changed since Mary Kingsley bemoaned the absence of scientific endeavour.

It has not by any means been plain sailing. There have been epidemics of what is believed to be yellow fever, the latest occurring on the Gold Coast in 1923; there has been need of expert advice, and in this connection we may cite the visit of Professor Simpson in 1909 and that of Sir Rubert Boyce in 1910.

Professor Simpson's expedition was undertaken in order to—

- (1) Take control of the arrangements for combating the spread of bubonic plague on the Gold Coast.
- (2) Discuss with the local authorities in the colonies visited the quarantine laws in West Africa, with the object of possible amendments in some particulars to bring them more into harmony with modern theory and practice.
- (3) Visit some towns and other places in Sierra Leone, the Gold Coast, and Southern Nigeria, with a view to investigating their sanitary condition.
- (4) Form an opinion by the best means at his disposal in regard to the effectiveness of the existing organisation and equipment of the medical service of the colonies from the point of view of public health and preventive medicine generally.

His conclusions were embodied in a valuable, comprehensive, and well-illustrated report in the course of which he states :—

“ The death-rates of Europeans now given in the annual reports of the medical officers are very different from the appalling death-rates recorded by the military surgeons of Sierra Leone and Cape Coast in the early half of the nineteenth century. A comparison of the figures might readily lead to the erroneous conclusion that there had been also an extraordinary improvement in the health conditions of the country, unless it is borne in mind that in the early days the death-rates relate in some instances to a mixed population of men, women, and children, to soldiers on expeditions, and to Europeans who lived out there without coming home, and, in Sierra Leone, to periodical epidemics of yellow fever. Further, it is to be remembered that personal hygiene in relation to the tropics was little understood in the older days, and that, although Cinchona bark was given in the treatment of fever, the causes of malaria were not understood, and the treatment by quinine was not invariably practised until the eighties, after Laveran's discovery of the malaria parasite. Perhaps it might be more correct to say until after the work of Manson and Ross, at the end of the nineties. The conditions that have changed belong to the individual rather than to the locality. Thus women are few on the coast and of a higher class, men serve only a year or eighteen months, medical treatment is early sought after when sick, invaliding is earlier resorted to, quinine is often taken as a prophylactic against fever, the mosquito net is almost invariably used for sleeping under, and most of the official quarters in three of the principal towns are segregated from the native town. There has been an advance in many respects in health matters within recent years, but the practical application of Manson's and Ross's investigations, having for its object the abolition of fever and of the conditions which breed malaria, has not progressed to any material extent. While those conditions remain, the coast will always be a menace to the health of Europeans, some years being worse than others, reflected, perhaps, not so much in annual death-rates, but in sickness and incapacity to do good work.

“ In regard to natives, trustworthy statistics do not exist. In Freetown and Lagos there is registration of deaths, but the causes are only in a small percentage certified by medical men. In Freetown the deaths are no index as to which parts of the town are most unhealthy, as the addresses of the deceased are not given ; there is much work for a medical officer of health in this respect. In Lagos only the street is given. There are no numbers of blocks or of houses.”

Professor Simpson's findings certainly bear out his contentions, and in addition it may be said that—as is ever the case in what may be called new countries, that is, territories in which civilisation in the accepted sense of the term has only recently begun to make headway—attention had been directed to the curative rather than the preventive side of medicine. A glance at his photographs is sufficient to reveal the grossly insanitary conditions which existed in many places, chiefly, of course, in the old towns.

His visit and the strenuous efforts he made in the direction of reform effected a very considerable change, and in October, 1909, he was appointed a member of the Advisory Medical and Sanitary Committee for Tropical Africa, which eventually became the Colonial Advisory Medical and Sanitary Committee mentioned in Chapter I. of this book.

This committee has never ceased to plead the cause of hygiene, in addition to advising on all matters connected with the health of British possessions in the tropics. It has been specially concerned with West Coast affairs, and has had the satisfaction of seeing a very considerable advance in prophylactic measures.

Sir Rubert Boyce's visit was connected with certain inquiries as regards yellow fever, and need not be further considered.

Only those who have been intimately in touch with sanitary questions as they affect the West Coast colonies can properly appreciate the magnitude of the work and the difficulties which have to be surmounted. These are very largely of a financial nature. It is easy to apportion blame, just as it is easy to forget all that has been accomplished.

The Great War naturally set the clock back to some extent. It dragged the West Coast into its meshes and for a time diverted energy into other channels. There was a paucity of staff and of funds, and great credit is due to those who continued to carry out their duties under trying and discouraging conditions.

Hard upon the heels of the war came the disastrous pandemic of influenza, infection being introduced from overseas in the first instance and constituting an example of failure in quarantine measures, for which, nevertheless, there was certainly some excuse. The West African Medical Service has, however, rallied, and of late years there has been commendable activity in several directions. Especially notable has been some of the research work carried out in the

Government laboratories at Lagos and Accra, and more recently in the newly established institute of the Liverpool School of Tropical Medicine in Freetown.

Attention is now being directed to the question of local medical education, in which the French at Dakar have given us a lead. It must be admitted that despite all that has been accomplished the French in their West Coast possessions have outstripped us in the matter of organised research. Their output has been greater, for they appear to set more value on such work than we do, or at least they subsidise it to better effect.

The Pasteur Institute in Paris is a stimulating force which has no parallel in Great Britain, and there is certainly need for some central institute which will advise, encourage, and suggest, which will act as a kind of clearing-house, and to which workers on the west coast and elsewhere in the British tropics may turn for assistance. The Tropical Diseases Bureau has fulfilled a most useful function in furnishing information, and the schools of tropical medicine have exercised considerable influence, but there is certainly room for further development on special lines.

As regards sanitation generally, much that Professor Simpson said in 1909 still holds good, but there can be no doubt that a veritable revolution has been effected in the last five-and-twenty years. There is every reason to believe that the West Coast possessions will not merely maintain but will enhance the reputation they have gained as territories rescued to a great extent from the thralldom of disease and now travelling steadily, if slowly, on sound scientific lines towards that hygienic efficiency without which their wealth and resources will avail them little.

Union of South Africa.—Of the great self-governing overseas possessions it may perhaps with truth be said that from the *Imperial* health standpoint the Union of South Africa is the most important. Its geographical position is such that, even having regard to the existence of the Suez Canal, the Cape, using the word in the wide sense, remains a half-way house to India, the Far East, Australia, and New Zealand, so far as trade is concerned. Its ports are in touch with those of India and Ceylon, and it is nearer the great endemic centre for plague and cholera than are the other commonwealths. It occupies a somewhat central and commanding position. Indeed one has heard the view expressed that in the remote future it will be chosen as the hub of the wheel

of Empire, and that the activities of London will be transferred to Cape Town. Be that as it may, public health questions are of paramount importance in the Union of South Africa, not only on account of its maritime connections but because it forms the southern portal to the African continent. Railway communication spreading ever northward carries with it grave responsibilities, as does the control of a very large and heterogeneous native population. Dr. J. A. Mitchell, the Secretary for Public Health and Chief Health Officer of the Union, has in the official Year-book traced the history of public health in South Africa both before and after the constitution of the Union. We transcribe his statement in full, for it furnishes the main facts in a clear and concise manner:—

“ Except in regard to epidemics (mainly of small-pox) the early records contain little information about public health. This is to be expected in a country with a sparse and largely pastoral population. It is only when population increases, and especially as a consequence of its aggregation into towns and villages, that matters of public health assume greater importance and attract increased attention from the writers of the time.

“ Shortly after the landing of Van Riebeeck and his companions in 1652, a hospital was established on the shores of Table Bay. In 1699 it is recorded that a new hospital was completed at Cape Town, and ‘ the sick moved into it from the old building on the beach.’ This hospital did duty until 1772, when a new one, accommodating 1450 patients, was erected on the site which subsequently became known as Caledon Square. This hospital was replaced in 1817 by an institution named later the Old Somerset Hospital, the buildings in Caledon Square being thereafter converted into military barracks.

“ Responsibility for dealing with outbreaks of infectious disease and other health matters at first rested with the Government, the duties being carried out by the district surgeons in addition to their medical and medico-legal duties. In 1836, the year of the *Great Trek* from the Cape, an ordinance was passed authorising the establishment of municipalities. These bodies, and later, in the Cape, the divisional councils (established in 1885, but not vested with public health powers until 1897), largely took over the care of the public health within their area. The duties continued, however, to be done either by the district surgeons or by other local medical practitioners. Whole-time medical officers of health were subsequently appointed by the larger local authorities as follows: Johannesburg, 1897;

Kimberley, 1898; Bloemfontein, 1901; Cape Town, 1902; Pretoria, 1902; Durban, 1903; East London, 1913.

" From the establishment of an administration at the Cape, health matters on vessels entering the port and at the ports themselves were dealt with by the government through its district surgeons, and later—in the cases of the larger ports—by special port health officers. The first *Quarantine Law* was passed in Natal in 1858, and between that date and 1899 eight amending *Quarantine Laws* were enacted.

" In 1883, following a severe epidemic of small-pox, the Cape Parliament passed a *Public Health Act* dealing with infectious disease, vaccination, quarantine, and disinfection. This was supplemented by an amending Act in 1897, which provided for the appointment of a Medical Officer of Health for the colony, and contained important provisions regarding water supply, drainage, housing, and sanitation.

" In Natal a *Public Health Act* dealing with infectious disease and sanitation was passed in 1901, and a *Vaccination Act* in 1906. In the Transvaal a law relating to infectious and contagious diseases and vaccination was passed in 1895. In the Orange Free State a law was passed in 1899 dealing with plague and other infectious diseases, and another dealing with contagious diseases. A *Vaccination Ordinance* was passed in 1903; but its application was postponed, and in 1909 it was amended in material respects. A comprehensive *Public Health Act* was passed by the Orange River Colony Parliament in 1907, but its adoption was discretionary and few local authorities availed themselves of the privilege.

" Whole-time government health officers were first appointed for the Cape in 1892; for the Transvaal in 1900; and for Natal and the Orange River Colony in 1901. About the same dates public health and bacteriological laboratories were established in Cape Town, Durban, Pretoria (transferred to Johannesburg in 1904), and Bloemfontein. The government health officers acted mainly or entirely as advisers and inspectors, the administration of public health being carried out by a government department, usually that of the Colonial Secretary, which also dealt with local government and other matters.

" In 1906 a conference of government health officers of the Cape, Natal, Transvaal, Orange River Colony, Southern Rhodesia, Basutoland, and the Bechuanaland Protectorate was held in Cape Town, and made important recommendations which were submitted to the several governments concerned.

" The South African Act, 1909, assigned to the Provincial Councils the administration of all local government matters and of hospitals and charitable institutions; also of elementary education, which has since been interpreted as including school

medical inspection and hygiene. Public health is not mentioned in the Act (indeed it does not appear to have been mentioned during the discussions at the convention), but was considered to have been a matter under the control of the Union Government. After the constitution of the Union, administration was carried on by the Department of the Interior, with an Advisory Medical Officer of Health for the Union at Pretoria, and three assistant health officers, with headquarters at Cape Town, Durban, and Bloemfontein respectively.

" Short amending *Public Health Bills* were introduced in the Union Parliament in 1911 and 1912, but were not proceeded with. On 1st December, 1917, following a conference of government health officers held at Cape Town in May preceding, a separate sub-department of public health in the Department of the Interior was constituted, under the direction of the Medical Officer of Health for the Union.

" A comprehensive consolidating and amending *Public Health Bill*, designed to replace the existing public health legislation of the several provinces, was drafted in 1913; this draft bill was published and distributed to local authorities for their information and criticism in the following year, but owing to the war and other circumstances it was not proceeded with. Meanwhile, owing to the indefiniteness of the *South African Act* regarding public health and cognate matters, the administrations of the several provinces had proceeded on lines which were in certain respects divergent, so that a full discussion by all parties concerned had become highly desirable. A conference, comprising the administrators of the several provinces, representatives of the government, the provincial [municipal associations and divisional councils, and other bodies concerned, was accordingly convened by the Minister of the Interior, and met at Bloemfontein in September, 1918, under the chairmanship of the minister, Sir Thomas Watt. The conference discussed most of the important questions at issue, and unanimously passed a series of resolutions regarding general policy and the respective spheres of the government and the provincial administrations.

" Subsequently the draft Bill was revised so as to embody or harmonise with these resolutions. The Bill, so revised, was introduced in January, 1919; and was, with certain amendments, passed by Parliament, receiving assent of His Excellency the Governor-General on 20th June, 1919. Sections *two to five* of the Act, relating to the establishment of a Department of Public Health with separate portfolio, the functions and duties of the department, the establishment of a Council of Public Health, and the appointment and duties of officers of the department, were proclaimed in force on 1st July, 1919. *Gazette* notices were simultaneously published notifying the appointment

of the Honourable Sir Thomas Watt, K.C.M.G., as Minister of Public Health, and the establishment of a Department of Public Health to administer all matters relating to public health, adulteration of food or drugs, district surgeons, medical councils, and pharmacy boards. The remainder of the Act came into force on 1st January, 1920. Matters relating to leper institutions and to mental hospitals and mental diseases continue under the administration of the Department of the Interior."

There is little to add to this succinct account, but it may be said that inquiry has shown the existence in 1879 of a Public Health Bill for the old Cape Colony, which consolidated previously existing Acts for the control of infectious diseases, public nuisances, and village nuisances.

A recital such as the above provides the administrative details, and is of distinct value also as showing how closely the sanitary development of South Africa has resembled that of other countries. Moreover, it would appear to have proceeded on sound lines and to have gained a high degree of evolution, for the establishment of a Minister of Public Health is synonymous with the addition of a coping-stone to a building—it crowns the edifice. Yet how little these dry, if useful, details avail in the endeavour to give the layman some idea of what it has all meant in the way of life and death, to make him realise, at least in some degree, the unceasing care and vigilance required and exercised, the constant watchfulness maintained at the ports, especially in the effort, not always successful, to prevent the introduction of such diseases as cholera, plague, and small-pox from India and Ceylon. The danger arising when a portal of entry is under foreign control was exemplified by the introduction for the first time of plague through Delagoa Bay in 1889; yet subsequently, during the Boer War, other infections took place through Cape and Natal ports.

Again, one pictures the old rough and ready days when enteric fever and dysentery, due to infected water and the agency of flies, were too often the companions of those subduing the wilderness, and when small-pox was apt to occur and run riot among the natives. The conditions were very different from those obtaining in India but became more complex as time went on and settlement proceeded. The moment industrialism was established on anything like a large scale danger threatened in various directions.

As usual everything at first was more or less happy-go-lucky, and the hygienist marched, as he has usually marched,

well in the rear. Formerly, in the opening up of new countries just as in time of war, it was apparently inevitable that there should be no sanitary foresight. The wastefulness of such a method of procedure needs no comment, and who can say how many graves dot the veldt as reminders of the suicidal policy of the past? Gradually, however, order was evolved out of chaos, as the usual stimuli came into operation—fear and discomfort in the first place, the pinch of the pocket in the second, as employers of labour began to understand that it pays to sanitise and control, and local authorities slowly realised their responsibilities. Mitchell, in the work quoted above, gives an interesting account of the history and prevalence of certain diseases in the Union, dealing especially with cholera, enteric fever, influenza, leprosy, malaria, undulant (Malta) fever, plague, small-pox, tuberculosis, typhus fever, and venereal maladies. It is impossible here to discuss these at length, yet we cannot but recall the terrible outbreaks of typhoid and dysentery during the Boer War and the way in which infection was spread to the civil population. The price of empire here, as too often elsewhere, was exacted to the full in deaths and invaliding from preventable diseases.

The surprising development of Kimberley, and then of the Rand, brought its own difficulties and rendered it necessary to take action, especially as regards scurvy, pneumonia, and tuberculosis. The influx of natives from many parts of Africa demanded special watchfulness. Questions of immunity and non-immunity had to be carefully studied, and for a time conditions amongst the labour forces were by no means satisfactory. As so often happens, out of evil came good, and the loss and suffering occasioned in the mining industry of Johannesburg and its neighbourhood led to the establishment in 1912 of the South African Institute for Medical Research, supported partly by government, partly by the Witwatersrand Native Labour Association. Since its foundation this institute has played a great and increasingly important part in the fortunes of the Union, and perhaps nowhere else has the application of medical research to labour problems reached such a high degree of practicability and efficiency. This has been peculiarly evident in the case of the deficiency diseases, pneumonia, miners' silicosis, and tuberculosis. The bacteriological work of Sir Spencer Lister on pneumonia possesses an importance which is far from being confined to local conditions. In addition to the above

activities there has been much research and routine work of a general nature and the great building, admirably equipped, has become a centre of light and learning.

Along with the laboratories of this institute others have, of course, developed, chiefly in connection with the health work in the large towns. In some of these also research has been prosecuted, and the country has benefited thereby. A system of research grants administered by a special board has been instituted, and doubtless some of these will be applied to the furtherance of work having a bearing on the advancement of the public health.

Germane to the subject of research is the question of public health inquiries on the large scale. Of these there have been several. We would cite the government commission appointed in 1912 for the investigation of tuberculosis. Its work was interrupted by the war, but is to be resumed, for in certain rural districts tuberculosis is spreading to an alarming extent amongst the natives. The Miners' Phthisis Medical Bureau was established in 1916, and its inquiries are carried out in the South African Institute. The object is to prevent any one infected with tuberculosis from working underground, and the magnitude of the undertaking will be apparent when it is stated that complete medical and radiographic records of over 36,000 miners and others have been obtained. One of us has been privileged to see the X-ray installation and the nature of the examinations conducted, and can testify to the remarkable character of the work accomplished.

A plague survey has demonstrated that several other rodents, in addition to the rat, are concerned in the transmission of the disease in the Orange Free State and the Karoo districts of the Cape Province; the distribution of malaria throughout the Union has been determined, while the widespread occurrence of typhus fever in Cape Colony has necessitated a special investigation by a medical committee and the adoption of energetic measures for its suppression.

So far as general sanitation goes, conditions have altered greatly for the better of late years. The most recent developments have been concerned with infant and maternity welfare and town planning. There has been great activity and much valuable propaganda work has been carried out, so that it may safely be said that South Africa is well to the fore in the beneficent business of safeguarding the public weal and proving the truth of Emerson's favourite dictum that "the

first wealth is health " or that of Ruskin to the effect that " there is no wealth but life."

Yet even so all is not well. As Mitchell, a prime mover in the recent progress, maintained so late as 1922, " there is much in the present state of South Africa that is unsatisfactory, or even disquieting, from the points of view of public health and welfare and the future of the country." In a very able address, characteristically entitled " The Public Ill-Health," he explained his reasons for the above statements, and they are so impressive and well put that we quote them here in full :—

" A considerable section of the population—not only native and coloured, but European—lives under conditions of overcrowding and insanitary housing ; many of the smaller towns and villages still have dirty and polluted water supplies from furrows or shallow wells, so that worms and intestinal diseases are rife ; in many centres tuberculosis is a serious scourge ; malaria is prevalent and is retarding the development of a large part of the Transvaal, Zululand, and the northern coastal belt of Natal, comprising some of the most fertile parts of the country ; the death-rate of the Union is considerably higher than it ought to be ; the European infant mortality rate in most places, and for the Union as a whole, is at least twice as high as it ought to be—what has been done in other countries, and especially in New Zealand, shows that it could be reduced to a half, or in some places a third, of the present rate. The native in the towns is a very grave public health problem. Among the people there is widespread ignorance and carelessness regarding health and cognate matters, including the care of infants and children, and the feeding both of children and adults. Comparatively little is being done to enlighten the rising generation in these matters, and to teach and inculcate the elementary principles of healthy living. Very few of our population are actually short of food ; a considerable proportion eat too much for the amount of work they do and the exercise they take ; a still larger proportion do not eat the right kinds of food and do not cook what they eat in the right way. Reports of school medical inspectors show that malnutrition is common, even in the children of the well-to-do. Children are fed mostly on sloppy food requiring no mastication and resulting in decay of the teeth, imperfect development of the jaws and permanent damage to health and vigour. Attending football matches and gladiatorial shows is more popular with the mass of the people than active participation in games and health-giving exercises. There is widespread use of patent nostrums and " Dutch "

medicines—the amount spent on these annually must be very large. There is a great dearth of maternity nursing, especially in rural areas; the annual loss of infant and mother life from this cause is enormous. The people as a whole are becoming more extravagant and pleasure-loving. The Union, with a white population of a million and a half and an annual Government expenditure of £29,000,000, spent in 1920, £900,000 on bioscopes and entertainments, and no less than £11,000,000 on liquor, not counting the loss to the State, direct and indirect, and the cost entailed by the resulting crime and disease and interference with industry. If South Africa “went dry,” how much could be done for the welfare of the people and the development of the country with the money saved!

“There is a growing disinclination in both sexes for the ties and responsibilities of marriage and parenthood. The average age of marriage is increasing and so is the divorce rate; here in Johannesburg the annual number of divorces is more than a third of the marriages. Large families have gone out of fashion and methods of restriction and birth control are increasingly practised. A type of female—more or less of the neuter gender—is becoming increasingly common; she doesn’t marry, or if she does she proves sterile, or takes care to have no children, or at most only one or two, and these she brings up on the bottle.”

Fortunately Dr. Mitchell is able to admit that there is a bright side to the shield. A quickening of interest, partly as the result of the terrible influenza epidemic of 1918-19, is evident among central and local authorities; churches and religious organisations are becoming cognisant that a practical religion cannot be divorced from health matters, that the body should be made and kept worthy of the soul which inhabits it; Boy and Girl Scout movements are leaving their mark; Red Cross societies are up and doing; and amongst the educated classes there is a fuller appreciation of what is meant by the *mens sana in corpore sano*. All this is hopeful, but the Secretary for Public Health strikes a special note when, after considering the rôle of the medical profession and rejecting the idea of a State Medical Service free to all, he says that “some radical modification of the present system is necessary before we can make any further general advance.” He puts forward a plea for the linking up of preventive and curative medicine, and asks that “some means should be devised of giving the private practitioner a live, real financial interest in prevention.” Citing the report of the English Consultative Council on medical and allied

services, published in 1920, he expresses the opinion that it would form an excellent basis for consideration and discussion, and mentions some of the advantages of a scheme whereby the private practitioner would lend his aid in questions concerned with ante-natal care, maternity and child welfare, school and industrial hygiene, tuberculosis, venereal disease, and so forth. The whole address is worthy of thoughtful study, and shows that the care of the public health throughout the vast territories of the South African Union is in good hands, and that a legitimate optimism is tempered by a commendable restraint and a recognition that much remains to be done before anything approaching a hygienic millennium may be expected.

Rhodesia.—Little need be said regarding those territories which until recently were administered by the British South African Company. Their hygienic future must to a large extent be bound up with that of the great Union lying to the south of them, and with which they are linked by the Cape to Cairo railway. At the same time the existence of direct railway communication between Salisbury in Southern Rhodesia and Beira, a port of Portuguese East Africa, must not be forgotten, for it reproduces conditions somewhat analogous to those existing between the Transvaal and Lourenço Marques.

So far as Southern Rhodesia is concerned, its problems are very similar to those of the Union, save that the Boer pastoral population is not largely represented, and that there are far fewer of those "poor whites" who in the Union form a not inconsiderable proportion of the non-coloured inhabitants and who, being backward and shiftless, constitute a troublesome minority from the sanitary standpoint.

Malaria and blackwater fever also are more in evidence in Southern Rhodesia, and have proved one of the chief obstacles to hygienic progress. Yet progress, if slow, has been steady, and Dr. A. M. Fleming, the medical director, has commented on the change he has noted since the early days when almost every one in the country looked yellow, anæmic, and fever-stricken at certain seasons of the year. He states that it would now be hard to find any collection of people exhibiting a higher degree of general physical fitness and less evidence of degeneration than are to be observed among the settlers at any gathering at Bulawayo, Salisbury, or other centre.

Putting aside questions of altitude and acclimatisation

with which we are not for the moment concerned, it may with truth be said that these happy results are due in large measure to persistent health propaganda and active work in the field, especially in the direction of better housing and food. The white population is, for the most part, intelligent and well-educated, and has to a great extent co-operated with the medical authorities in an effort to combat unhealthy conditions. The problems of Southern Rhodesia are those of a young country. It has not yet had to face the ills resulting from overcrowding, and its labour conditions are comparatively simple, though its rapidly developing mining industry has introduced complications and necessitated action more or less on the lines taken at the Rand. Happily it has plenty of data on which to base a sound sanitary policy in the future, so that, possessing as it does many natural advantages, there seems no reason why it should not steadily progress, although doubtless the malign influence of great heat and bright light on the white man, and more especially the white woman, will to some extent be in evidence.

Still less need be said about Northern Rhodesia, a country also in the making, but safeguarded by an efficient, if small, medical service. It has, however, special problems of its own, notably that connected with the incidence and spread of African sleeping sickness. Nevertheless this disease, save as regards severity of symptoms, has never attained the magnitude that it has assumed in Uganda and elsewhere; moreover, it is well under control. Again, there is the question of railway development, not always an unmixed blessing, for enteric fever, dysentery, pneumonia, and malaria are very apt to take toll of those who lay the iron track across the wilderness. Moreover, the linking up of Northern Rhodesia with a country like the Belgian Congo cannot but introduce fresh, and, it may be, significant sanitary problems. Opportunity is afforded for the spread of communicable diseases by the transport either of cases, say, in the incubation period, or of infective insects. The few townships are under sanitary control, and those parts of the country districts where malaria is rife may be expected to improve as reclamation advances.

Nyasaland, also a young country, need scarcely detain us. Here also sleeping sickness occurs, but is not at present a serious menace. Plague is perhaps more to be feared, and its introduction is much to be regretted. So far it has not assumed alarming proportions, but the mere fact of its

presence is disquieting in a country where rats are common and grain is the staple food of the native population.

Tanganyika Territory is much more interesting from the imperial health aspect, for here we took over a huge territory after a long, devastating war during which sickness was rife, malaria and dysentery were very widely distributed, and many other communicable diseases were largely in evidence. Moreover, the peculiarity of the situation is heightened by the fact that there is now an opportunity of contrasting whatever may be accomplished after the war with the sanitary system introduced and maintained by the Germans. In certain directions this was very creditable, despite statements to the contrary, and the value of scientific research had been fully recognised. In some matters, however, as, for example, the practical sanitation of certain of the towns, including Dar-es-Salaam, the capital, the Germans were curiously out-of-date and inefficient. Some of their house drainage arrangements, for example, were very faulty, and they appear to have spent more on building materials than on the essentials of sound sanitation, except possibly where actual house construction is concerned. It may be said at once that though it will take a long time to institute all the hygienic measures which are desirable, especially in the more remote districts, and though important problems like those of sleeping sickness and leprosy have so far scarcely been touched, yet a gratifying amount of energy has been displayed and progress in certain directions has already been marked. Most significant are the efforts being made to educate the native in the laws of health and to train native sanitary inspectors. Though money has been none too plentiful, much has been done in the way of improving Dar-es-Salaam, by attention to water-supply, markets, anti-mosquito measures the disposal of excreta and refuse, and all the multifarious matters over which a modern medical officer of health now holds sway.

The need for laboratory assistance has not been forgotten, and very creditable work is being done in the way of preparing vaccine lymph and aiding the hospitals.

A study of the two annual reports on medical and sanitary matters emanating from this territory since the war reveals considerable enthusiasm and a sound appreciation of the problems to be faced, a good knowledge of the work required, and a healthy recognition of the magnitude of the task and the necessity for further effort. Tanganyika has undoubtedly

made a good start, but here, as elsewhere, shortage of funds proves a bugbear to the hygienist and is apt to cause him to lose heart. A good start, however, means half the battle, and, unless something quite untoward happens, our latest East African possession should continue to give a good account of itself and be able to demonstrate that its sanitary measures have been deliberately devised quite as much for the good of the native as for the benefit of the white men within its gates.

Zanzibar is interesting in many ways, specially perhaps because here Africa, Arabia, and Asia seem to meet and blend, and all kinds of sanitary questions arise in consequence.

It is not always easy to obtain reliable details of the sanitary condition of places many years ago, for the recording traveller or the historian was apt to pay little attention to what was regarded as an unsavoury and unprofitable subject, and beyond passing references to evil odours or some very glaring atrocity, he did not trouble his head or his reader with particulars.

The city of Zanzibar, however, actually had a whole chapter devoted to its sanitary condition in a work on the cholera epidemics in East Africa written by Dr. James Christie and published in 1876. A few extracts well repay transcription. Here is one of them :—

“ There are neither sanitary laws nor regulations regarding the cleansing of the place, and every one is left to do precisely as he thinks proper, without let or hindrance. Within the last few years something has been done to remedy this state of matters by the employment of criminals for removing the filth of the town, but this is more advantageous as a punishment than as a sanitary measure, for it merely encourages laziness, and the householders are glad of the opportunity of having their filth removed free of expense.

“ In Zanzibar there are no local taxes for any such purposes, and consequently no means for taking even the initial step regarding any sanitary measure.”

Again :—

“ The sewage of the town is not utilised for agricultural purposes, and the excrementitious matter is never removed from the vicinity of the dwellings except by the means mentioned.

“ The latrine, which are in connection with every house, with the exception of the small negro huts, are merely shallow

pits or wells, and the contents are not discharged by sewers to the sea-beach. If sewers ever existed they are not now visible. They are always in connection with the bathroom, and the fluid contents percolate the porous soil, and gradually find their way to the adjacent shore. When the latrinæ become blocked up with the accumulations of a generation or two, as the case may be, they are either closed up and new ones excavated, or the slimy, semi-solid contents, are baled out on the public streets, and left to find their way by the nearest slope towards the sea-beach according to the laws of gravitation, and it is only when a heavy rainfall occurs that such abominations are washed away."

But help was not altogether lacking, for, as Dr. Christie records :—

"Countless myriads of ants and beetles, millions of rats, and armies of wild dogs, aid in removing the garbage of the town and suburbs, and the rain sweeps away to the ocean much of the filth of the place."

These agents had plenty to do, for our author reports that :—

"Civilisation in Zanzibar has not yet reached that point at which the public mind becomes alive to the fact that common decency is a subject worthy of consideration. From Zanzibar negroes, destitute of shame and of the slightest sense of propriety, not much can be expected, but one would naturally imagine that some reasonable regulations would be enforced to prevent them from outraging public decency, and creating a nuisance intolerable to all.

"Attempts have been made to prevent this, but the sea-beach continues to be used as the public convenience for negroes of both sexes, at all hours of the day, and with no more regard to decency than if they were brute beasts.

"This shocking state of affairs, in so far as the negroes and the poorer classes are concerned, ceases entirely to be a matter of surprise, and sinks into insignificance among the minor sins, when we see the same customs indulged in by the native merchant-princes of Zanzibar. These men, the *crème de la crème* of native society, expose themselves in this disgusting manner, and create a nuisance under the very windows of European houses where European ladies are resident. The Banyans are not an unreasonable class of men, and are the very opposite of a pugnacious race. Being under British jurisdiction, this disgusting custom could be put a stop to in a single day, and without the slightest trouble, merely by the imposition of a fine in case of

disobedience; but so long as wealthy British subjects are tolerated in their shameless practices, it will be of no use to attempt to restrain the negroes.

"No stranger ever lands at Zanzibar without expressing extreme disgust at the odious state of the sea-beach, even in the best-kept part of the town. To some it causes nausea and vomiting, and both olfactories and optics are most painfully affected. Except at high tide no one ever thinks of boat exercise, and it is only at that time that European ladies can approach the shore."

Dr. Christie quotes a caustic passage from Livingstone's *Last Journals*, which reads as follows:—

"The stench from a mile and a half to two miles of sea-beach, which is the general depository of the filth of the town, is quite horrible. At night it is so gross or crass that one might cut out a slice and manure a garden with it; it might be called Stinkibar rather than Zanzibar. No one can long enjoy good health here."

Pungent though this account be, it might with equal truth have been applied to many other places in the tropics, even at periods later than that with which Dr. Christie deals. Happily there has been a very considerable change, and British rule, whatever else it has effected in Zanzibar, has assuredly vastly improved the sanitary condition of the town.

More fortunate than many places, Zanzibar has always been rather opulent, thanks to cloves and copra, and a fair proportion of revenue has of late years found its way into the sanitary coffers. It is an important little centre, for its Port Quarantine Service includes the charge of the quarantine station for Kenya, Uganda Protectorate, and Tanganyika Territory. Here rat-ridden and plague-infected ships call for Claytonisation, and dhows also full of vermin and with plague on board, are freed of rodents and fumigated; here there is a street cleanliness uncommon in the East, and a very useful laboratory and museum. Certainly, though still a place of strange and varied odours, it no longer merits the approbrious appellation suggested by David Livingstone, who lived there in 1866. Moreover, Zanzibar is one of those places which have been able to afford the services of an expert town-planner, and it is preparing to remedy faulty housing conditions without æsthetic loss.

It has the usual sanitary problems of the tropics, but it

has mastered most of them, and is now perhaps more concerned with veterinary than with human hygiene. At the same time, situated as it is, there is need for constant watchfulness, and such diseases as small-pox and plague claim special attention, while ancylostomiasis, filariasis, malaria, leprosy, yaws, venereal complaints, and tuberculosis have to be combated. The control of opium also falls to the lot of the Public Health Department.

In Zanzibar the administrative arrangements are rather specialised, for the Public Health Department is divided into three sections :—

1. The Public Health Division, in charge of the Medical Officer of Health.
2. The Veterinary Section under a veterinary officer.
3. The Biological Section under an economic biologist.

To judge by the results obtained there is something to be said for this triple line of work. At any rate it is conceived on a broad basis.

Kenya Colony.—The early sanitary history of the African East Coast was in some ways like that of West Africa. There were a few settlements on the seaboard where persons lived under unhealthy conditions, usually more or less in the midst of a crowded native population, periodically exposed to outbreaks of fatal communicable disease, and at all times liable to malaria, enteric fever, and dysentery. Comparatively little was known of the interior, at least by Europeans, partly because of the difficulties of travel, partly owing to the hostility of natives, partly to what was called the deadliness of the climate, that is to say, the prevalence of diseases which were not understood and hence could not easily be avoided.

In the days of the Imperial British East Africa Company there were a few cultured medical officers, but there was no organised care of the public health, and indeed this may be said to have come into operation only when the control of the country became vested in the Colonial Office in 1905.

From that time onwards sanitary progress has been steady, though not until quite recently can it be said to have kept pace with the commercial developments of the colony. At the outset it may be noted that there are some useful lessons to be learnt from a survey of the sanitary history of Kenya. Lack of wisdom and of foresight is apparent in the position chosen for the capital, while, save as regards its European residential section, Nairobi is an example of how a town should not be planned and built. There can, indeed,

have been very little real planning about it. As a matter of fact, in the early days, everything was subservient to railway needs, and it is but rarely that the railway engineer troubles his head about sanitary questions. A few improvements have slowly been effected, but at what a cost! Like a canker the Indian bazaar, foul, overcrowded, ugly and menacing, remains in the middle of the town, a nursery for plague, a blight upon the landscape. Never was there a better chance for building a fine, up-to-date town on a virgin soil, with ample space at command, with adequate drainage, with all the sanitary advantages which experience has created; a town which might have been a model and the pride of Eastern Africa. Never was an opportunity so wasted and wise advice so disregarded.

Again, the public health aspects of Indian immigration were apparently never seriously considered, and yet these are of great importance and have proved a source of much trouble and expense.

Yet another lesson is imparted by what happened when the railway opened up the country and by its extensive connections tapped Uganda, where plague had long been endemic. As always happens, the disease followed the trade route, and, from being stationary, became mobile.

In the old days of the Chartered Company there were only some three or four medical officers in the whole country, the earliest of whom arrived in it in 1888. They became absorbed when the Imperial Government took over the protectorate. In 1895 a Principal Medical Officer was appointed, and he had a staff of two doctors! At this time there were four medical officers in Uganda, which had a distinct medical service, while yet another element appeared in the shape of the medical staff attached to the railway as it began to creep inland from the coast. In 1903 all the three services were amalgamated and during the next five years, under the fostering care of Lieutenant-Colonel Will, whose name deserves to be remembered, great progress was made, so that in 1908, when the Uganda and East African services were again separated, each had obtained the nucleus upon which the present organisations have been built up.

Taking the East African Protectorate only, we find that progress was slow, for money was scarce and there was the usual lack of foresight. As is customary, the medical side of the service dominated the situation. Sanitation, it is true,

was not neglected, but it was relegated to a secondary position. It is only fair to state that, quite apart from financial considerations, there was something to be said for such a course. We were developing a new country. There was a mere handful of Europeans and it was important to obtain the goodwill of those wild tribes whose country was in process of being occupied. Nothing appeals to the native more than efficient medical attendance. He appreciates a hospital, at least a good hospital, perhaps more than any of the other advantages of civilisation. Indeed it is one of the very few for which he has any use at all. A skilled and sympathetic doctor is more of a civilising and pacifying force than a company of infantry, and a well-run hospital has greater power in the long run than a battery of maxim guns. Hence it is not surprising that the curative rather than the preventive side of medicine was prominent at the outset. The pity is not that it was for a time predominant, but that it continued so. The country needed watching, and the type of watch-dog required was the Medical Officer of Health and the Sanitary Inspector. It is true that both were in evidence from a comparatively early period, but there were very few of them and there was a vast deal to be done. Indians were pouring into the country, Europeans were trickling into it. Settlements were being formed along the railway, Nairobi was growing on its unsuitable site. There was grave risk from plague; there was great need for a sound sanitary policy; but without trained personnel no such policy could be forthcoming. The result was ere long apparent, although it is true that considerable improvements were effected, and the staff was strengthened in various directions. It is no doubt easy to be wise after the event, but here, as elsewhere, one is reminded of the old saw as to shutting the stable door after the steed has been stolen, though there were undoubtedly, excuses for the delay in grasping the situation and making provision for the crying needs of the young Protectorate. These are set forth at the beginning of Professor Simpson's voluminous *Report on Sanitary Matters in the East Africa Protectorate, Uganda, and Zanzibar*, for, as has too often been the case, the sanitary state of the country became so unsatisfactory that the services of an expert had to be requisitioned. Professor Simpson made his inspection in 1913, and reported fully on the whole situation. Readers are referred to his very able, interesting, and informative account of the conditions he encountered and the recommendations

he made. It sums up the whole story and deals especially with epidemic diseases, notably plague, and with the sanitation of Mombasa, Nairobi, and Kisumu. Here and there we find a very quotable and suggestive passage, as, for example :—

“ With so many demands on the financial resources of government it is not surprising that the claims of sanitation and public health and medicine, which possess the disadvantage of being usually considered unproductive and which could only add to the monetary embarrassment, have not received the attention they deserve. This is specially noticeable in the East Africa Protectorate, and in consequence the advancement in public health measures has been in no way proportionate to the development and needs of the country. The admirable drainage scheme, for instance, that Mr. Bransby Williams drew out for Nairobi in 1907 and which was begun in 1908, is still in its early stages, though it should have been completed some years ago. The Indian bazaar which he condemned is still on its old site and in a worse condition than in 1906 when he advised its removal. [As we said, this state of matters still persists.] These, together with the haphazard growth of the town which is being permitted, have brought about such a condition of insanitation that Nairobi though scarcely fourteen years old, and aspiring to be a European town, is in its commercial area one of the most insanitary I have seen.”

Elsewhere in his Introduction he says :—

“ Already plague, cerebrospinal fever, small-pox, dysentery, typhoid fever, and malaria, by their prevalence are forcing themselves to the front and demanding attention. There cannot be the slightest doubt that some of these epidemic diseases are capable of becoming very formidable and destructive as long as existing conditions are permitted to remain, and as long as there is no effective sanitary organisation supplied with the requisite funds and powers to take the necessary measures to remove these conditions, to check and prevent disease, and to preserve the population, which, in this instance, is the chief asset of the country.”

It is a sad picture that Professor Simpson paints, a picture perforce limned in places with lurid colours ; hues befitting the calamity of a fine country going to rack and ruin in a sanitary sense for lack of foresight and of money.

We cannot here dwell longer on a somewhat painful theme,

but nowhere is there a clearer demonstration of the wastefulness and folly of permitting a new country to develop (save the mark!) without proper hygienic guidance than in these introductory remarks. Scarcely had Professor Simpson presented his report when the Great War supervened, and effectually prevented most of his recommendations from being carried out. At the same time the effect of the war was not altogether bad, for the influx of troops was accompanied by a certain amount of sanitary activity, and this reacted favourably in some instances on local conditions. For example, at Nairobi some efforts were made which might never have been forthcoming but for the presence of camps and military hospitals. On the other hand, the war undoubtedly heightened the incidence of disease in the Protectorate. Carriers returning from what was then German territory brought back the parasites of malaria, dysentery, and other disorders, and the dislocation of the usual administrative machinery led to difficulties in food supply, with their customary consequences.

After the war, however, there was certainly a marked change for the better. The medical and sanitary staff was augmented, conditions of service were improved, an air of energy and keenness replaced the dejection and apathy which formerly were all too common. Kenya Colony, as it is now called, appeared to have settled down in earnest to grapple with its hygienic problems and fine work was being done. Unfortunately, in 1922 retrenchment became the order of the day, and the staff had to be cut down until it became woefully small considering the vastness of the territory and the urgency of the situation. The Principal Medical Officer states that his staff had been reduced to the lowest possible limits, so that but for the whole-hearted co-operation of all sections of the personnel, it would be impossible to carry on the existing activities, and that "the margin of safety has been reduced all round to the barest minimum, especially with regard to the sanitation and public health requirements of the country."

Now these latter have a very distinct bearing on imperial matters, for the country can afford neither to import nor to export plague. The danger is the greater in that the deep-water pier at Kilindini is approaching completion, and sea-going vessels will berth at the quays and not be dependent on lighterage as hitherto. Hence a greater risk that plague rats may gain the shore from the ships and the ships from

and properly built native huts exist and that quite a healthy life can be passed in well-planned native villages, it is also the case that very often the hut is nothing but a foul hovel, ill-constructed, badly ventilated, unspeakably dirty, overcrowded, a place where man consorts with the domestic animals and with vermin of all kinds. Not infrequently also congeries of huts are badly placed, badly arranged, and badly looked after. The native has to learn to plan and to build something better in the way of a habitation. Hence it is all-important that ~~there~~ should be skilled carpenters and metal-workers in the land. So far the settlers have been opposed to such an advance. They wanted to have plenty of labour—more or less unskilled labour—for their farms. But what has been called the Indian menace has somewhat altered their views, and in any case government is pledged to do something tangible to advance education. In addition to a sound technical training there should be instruction in the elements of hygiene, with special application to the conditions obtaining in the colony. In Kenya, unfortunately, there can be nothing very elaborate in the nature of a training school for what the French call "infirmiers" till some years have passed, but at least a beginning has been made. The necessity of providing some kind of subordinate native medical staff is yearly becoming more apparent. This subject, however, will receive more attention when we speak of Uganda, where the outlook is totally different and where the steps already taken have been amply justified by the results achieved.

Yet another subject which must be considered in connection with Kenya, and one which is very distinctly of an imperial nature, is the question of the acclimatisation of that section of its white population which inhabits its highlands. It is one of great importance, but it is also one regarding which, with our present knowledge, it is impossible to give a definite answer. It presents two aspects, closely related to each other, and both of them demand attention. The first concerns the future of the white race viewed merely in the light of inhabitants; the second, their prospects as actual tillers of the soil. In other words, can the Europeans persist as an active, healthy, and virile race in these uplands, propagating their species and fulfilling their destiny as they would in a temperate climate, and, if so, is it possible for them to engage in out-of-door manual labour and to follow those pursuits which in the tropics usually fall to the lot of the black and coloured races of mankind? Let it be clearly

understood that we are not dealing with the general question of the white race in the tropics. That is much too large a problem to be handled here and is the subject of much controversy and considerable misunderstanding. In Kenya, however, actually upon the equator, an experiment is being conducted on a large scale which has not its exact counterpart anywhere else in the world. The elevation at which the white settlers live greatly modifies the climatic conditions, while the more serious tropical maladies, as, for example, malaria and ancylostomiasis, are little in evidence. The question really resolves itself into whether the heat and bright light which prevail will detrimentally affect the nervous systems, not perhaps of those at present resident in the highlands, but of succeeding generations. Will the race degenerate or will it maintain its intellectual and moral vigour? We cannot tell. Time alone will show, but it is significant that there is evidence that the conditions mentioned do adversely affect the nervous systems of European children resident in Nairobi, when they attain the age of puberty. At an earlier period there is stimulation, the effect is beneficial; but in the case of both boys and girls this early stimulation is followed by a certain degree of exhaustion. There is a menace of retrogression. At least so we gather from the observations of Mackinnon on school children in Nairobi, the sole data available at the present time. Still, the country is only in the making, conditions of life will improve and many factors have to be considered, so that it is well to keep an open mind on the main issue and to adopt for the present at least a hopeful attitude. The study of the problem certainly emphasises the necessity of ensuring hygienic surroundings and lessening in every possible way the strain which is undoubtedly thrown on the organism, especially in the case of women and children. As regards the question of the white man and field labour it is conceivable that a certain proportion of settlers could undertake such duties without prejudice to health, but the working day would have to be short and would not satisfy the agricultural needs of the colony. Moreover, in a country like Kenya such a development is distinctly undesirable—another reason why it is so important to safeguard the health and future of the native races, who are adapted by Nature to withstand the climate, and who, as Professor Simpson stated, form the chief asset of the country.

Finally there is the vexed question of the Indian immigrants. We are not here concerned with it from the political

or economic standpoint but solely from that of the public health. This cannot be ignored, and indeed it constitutes one of the most pressing problems of the day. Speaking generally, the class of Indian in the colony is not one which has attained a high level in sanitary matters. The reverse is the case, and for the most part the influence of the Indian on the African, so far as hygiene is concerned, has been unfortunate. The educated Indian has, of course, reached a certain standard, and there are many whose mode of living does not differ from that of the European as regards personal and domestic cleanliness. Moreover, there are not a few who take a keen interest in matters hygienic and fully realise their duties to the community. On the other hand, in most Indian households there will be found retainers and others whose ideas and habits are at variance with the customs followed by Europeans as the result of their training and upbringing. In these matters East is still East and West is West, and hence there is apt to be clashing and a cry for segregation. The cure lies, of course, in education and the development of a public health conscience in all concerned, but education is a slow process at the best. The situation is complicated and difficult, but at least it enforces the lesson that there must be an efficient sanitary service in all places where there is a mixture of races. This will help to mitigate such evils as exist, and it is a fact that most people, whatever their origin, tend to take the tone of their surroundings. There is nothing like a good example, and that must be set by those responsible for the welfare of the populace. They must supply the leaven of cleanliness, using the latter word in its widest significance, and it will be found that though it permeates slowly it will yet permeate surely and bring about results which will exercise a profound effect on the future of one of our most promising possessions.

Uganda.—Great is the difference when one passes from Kenya Colony to Uganda. It is something like the transference from a moorland to a garden. From bare and arid Kisumu the traveller is transported to the green slopes of Jinja or the bright foliage of Entebbe. Even greater is the change in the appearance and character of the native population, but in many respects the sanitary history of the two countries has been similar, and they are faced by identical hygienic problems. At the same time some of these latter have, as it were, become specialised in Uganda, and therefore require more attention than would otherwise be bestowed

upon them. Foremost amongst them figure sleeping sickness and the venereal diseases, more particularly syphilis. The missionaries started medical work in Uganda, but, save indirectly, they have not been much concerned with sanitary matters. Still they have played a very important rôle in education and in abolishing individual foci of infection. As in Kenya, so in Uganda, the health service had very small beginnings, but the native rising in 1897-8 led to its being strengthened. Thereafter the great outbreak of sleeping sickness at the beginning of the present century focused medical attention on the country. Uganda indeed was very much in the public eye, for the dramatic story fired the popular imagination, the sufferings of the victims excited sympathy, and the investigations which were conducted and the results obtained appealed in somewhat the same manner as a Sherlock Holmes romance. It was indeed detective work, and that of a skilled order, which was pursued on the northern shore of the Victoria Nyanza.

Here was a mysterious malady which apparently had broken out in Uganda as the result of the opening up of the Dark Continent. It was regarded as a direct sequel of Stanley's explorations and indeed by many is still viewed, possibly with good reason, as the outcome of his work, for it is conceivable that he introduced the disease and its parasite from the Congo. There is, however, some evidence that a malady, which may have been sleeping sickness, had been present in Uganda to some extent for many years. Its native name, *Mongota*, meaning, to nod the head, is at least suggestive.

Whatever its origin, this human trypanosomiasis played havoc with the population and slew thousands upon thousands, especially in the beautiful and thickly populated Sese Islands and along the lake shore. Fertile districts became desert wastes; death and desolation followed in its track; it produced a great sensation and excited much alarm. Indeed it still remains the classical outbreak of human sleeping sickness. We need not here recount the history of the research work into its causation and method of spread, or describe the measures of depopulation of the infected districts, which were carried out on a large scale and with much thoroughness, and which, though no doubt other factors were also operative, proved highly successful. From the governor downwards every one worked with a will, and the plague was stayed. It is true that views originally held have had

to be modified, but Uganda will always be remembered as the place where the association of the trypanosome with the disease was fully demonstrated and the rôle of the tsetse fly as vector recognised. Ever since these days sleeping sickness has had to be combated in the country, not only on the Victoria Nyanza but in other parts of the Protectorate. Naturally the medical staff had to be strengthened both for ordinary and special work, and to this day medical officers are engaged exclusively on sleeping sickness duties. These have both an imperial and an international significance, for Uganda borders on British territory in the east and north and on Belgian territory in the west, regions where the disease is rife, and questions constantly arise as to infected persons crossing the frontiers, especially on the Congo side.

Much credit is due to those who faced, fought, and vanquished the great epidemic, and it is not altogether surprising that with such responsibilities added to the ordinary medical and surgical work of a rapidly developing country, little time was left for attending to routine sanitary affairs. Some efforts were made, and notable amongst them is the town-planning scheme which led to the establishment of the beautiful little capital of Entebbe—a garden town if ever there was one. Yet troubles multiplied. As in Kenya, there was plague; as in Kenya, there were many low-class Indians with insanitary habits; outbreaks of smallpox and of cerebro-spinal fever took heavy toll of life; there was much malaria, and, worse than all, venereal disease threatened ruin to the native population. Civilisation introduced these social maladies, and it is a trite saying that civilisation and syphilisation go hand in hand. A change took place in native customs as the result of missionary enterprise, and the introduction of European ideas and government. The women, hitherto jealously segregated, were emancipated, and for reasons into which we need not enter an amazing promiscuity developed. A truly appalling state of matters resulted, not only as regards the number of disease-ridden unfortunates but on account of the ensuing sterility and the waste of infant life. To cite one example only: the district of Bunyoro in ten years has witnessed a reduction of population from 120,000 to 80,000, due in the main to syphilis. Fortunately steps were taken to cope with all these catastrophes. Professor Simpson included Uganda in his tour of inspection and advice, and though his visit was limited to certain localities, he

indicated what was required in the townships of Entebbe, Kampala, Jinja, and Mbale, and dealt with plague in the last named and in the surrounding cotton-growing district.

As regards venereal diseases the campaign against them may be said to have begun in earnest in 1913, for in that year a special medical officer was placed in charge of the work, and legislation was enacted for ensuring compulsory attendance for treatment. The goodwill of the bigger chiefs was enlisted, and in several districts a start was made in the therapeutic work. A suitable hospital was built at Mulago, Kampala, and a scheme framed for the education of native assistants. The sympathy of the missionaries was forthcoming, and everything promised well in 1914, when, like a bombshell, the news of the outbreak of war burst upon the land. The work had to be abandoned during the course of hostilities, as had any hope of much progress in sanitary matters. The small staff had a great burden thrown upon them. Few indeed who were not in East Africa during the war can realise the strain that was undergone by the local medical officers both in Kenya and Uganda. For the most part they rose to the occasion. Some left on active service; others, possibly less fortunate, remained to do double and treble work under conditions rendered more difficult by the return of sick and wounded and by the fact that lessened control permitted communicable diseases to increase in incidence and severity. It was an anxious time, but while there was inevitably some retrogression and the scanty resources were strained up to and sometimes beyond the breaking point, remarkably good work was accomplished in certain directions. In Uganda a notable undertaking was the formation of the African Native Medical Corps.

The positions of non-commissioned officers in its ranks were filled by young Baganda of good family, who were trained as hospital orderlies and even as laboratory attendants. Many attained a high degree of efficiency, and the corps as a whole was most successful and certainly earned the encomiums bestowed upon it by those qualified to judge. Apart altogether from war service, its utility showed what a large amount of latent talent existed amongst the natives of Uganda, and pointed to what might be done in the way of training the Baganda as "infirmiers," subordinate medical officers, and sanitary inspectors.

After peace had been declared there was considerable discontent and dissatisfaction amongst the members of the Medical Department, but the Colonial Office took action and conditions were improved, though for a time it was difficult to obtain men to fill vacant posts and to take up new appointments.

The service has, however, slowly been built up and extended. There is still a paucity of personnel, but naturally it is wellnigh impossible to continue increasing the European staff. The finances of the country will not permit of such development. Hence the necessity of providing medical training locally, and steps are now being taken in this direction. The venereal diseases campaign was renewed and its great value was speedily apparent. It requires to be supplemented by maternity training centres and instruction in child welfare and mothercraft. These are entirely new ideas to the native mind, but the urgency and importance of such measures are apparent when one recalls the fact that the infantile mortality rates are the highest in the world. They reach the appalling figures of from 600 to 900 per 1000. No people can long withstand such losses. Yet the natives of Uganda multiply with extreme rapidity. Their fertility and fecundity are remarkable, and if only a fair percentage of the children born were saved there would be sufficient population for the needs of the Protectorate. This matter has a very distinct bearing on imperial affairs. Cotton is the hope of the country. It pays at every stage of its production for the market. It pays the picker, it pays for freight, it helps to pay the taxes, it pays the ginner, and so forth, but without ample and efficient native labour the cotton trade is doomed.

Hence, from every point of view, humanitarian, political, economic, it is essential to do everything possible to combat the malign influences which are depopulating Uganda and sapping the efficiency of its labour forces. It is a question of money and organisation. The thing can be done and must be done if the country is to be saved, and none are more alive to the perils of the situation, more eager to help or more appreciative of help than the educated native classes themselves.

This work, like all the hygienic work, must proceed *pari passu* with research. Happily, ever since the days of the great sleeping sickness outbreak, medical research has held a high place in Uganda. The value of the laboratory was

then proved to the hilt, and it is gratifying to note that this side of preventive work has received sympathetic consideration and that facilities exist which, though not extensive, are yet a great improvement on what previously obtained. In this connection we need merely mention the fact that reliable vaccine lymph can now be produced locally, an important advance in a land where small-pox is constantly a menace.

A large volume could be written on the hygienic history of Uganda. The story has had to be compressed into a few pages, but enough has been said to show the enormous responsibilities which a power like Great Britain shoulders when she extends her territories in Africa. She stands *in loco parentis* to the black races, and the first and foremost duty of a parent is to safeguard the health of those who look to him for sustenance and protection.

Anglo-Egyptian Sudan.—Those, and they were chiefly Army medical officers, who became responsible for the public health in a Sudan redeemed from savagery, had at first no easy task. It is true that, save for malaria along the Nile, the dry northern desert regions are not usually unhealthy, but the unhappy populace had been decimated by war, famine, and pestilence, and vast tracts and towns like Khartoum had been ruined by the Dervishes. With commendable zeal and energy a campaign of cleanliness was undertaken, and Omdurman, the great native city, was rendered fairly salubrious and habitable.

The new Khartoum rapidly sprang into being, but, unfortunately, from the hygienic standpoint, was placed on the southern bank of the Blue Nile, on a spit of land liable to flooding and exceedingly difficult to drain. In those days few, if any, looked forward to the time when a water-carriage system of sewage disposal would become a necessity for the capital.

At an early date the southern tropical provinces were explored and brought under control, but only at the cost of gallant and valuable lives, for at a time when there were no decent houses and few safeguards for health, the pioneers fell victims to malaria, blackwater fever, dysentery, and other ailments.

Still, the losses would have been greater if Ross's work in India had not by this time taught the necessity of guarding against mosquito infection.

The new Khartoum was, on the whole, well planned and

well built, and, though at first defective conservancy methods prevailed, the water supply was unsatisfactory and mosquitoes abounded, an enlightened government policy enabled improvements to be effected, so that, without any great difficulty, hygiene was placed upon a sound basis. At the same time constant watchfulness was required, especially as regards malaria. The country as a whole recovered with remarkable celerity. Small-pox was speedily controlled by efficient vaccination, food problems were solved, and information was collected regarding the prevailing diseases both of man and animals.

In the latter work, as in other directions, the Wellcome Tropical Research Laboratories of the Sudan Government proved their utility, and it was fortunate that they were established at an early period in what has been called the New Sudan and were able to deal with difficulties and dangers wellnigh from the start of the new régime.

The country enjoyed one great advantage over other British possessions. For years its destinies were controlled by one Governor-General. Hence there was a continuity of policy which can only with difficulty be secured in lands where governors serve for comparatively limited periods. Moreover, in Sir Reginald Wingate the Sudan was blessed with a gifted administrator, who realised the importance of matters hygienic and took a warm interest in sanitary development and in the furtherance of medical research. It was fortunate that this was the case, for his attitude, like that of Sir William MacGregor, stimulated those serving under him and set an example to his lay officials.

A period of steady progress and comparative prosperity, coupled with financial aid from Egypt, enabled funds to be found for the various measures required to safeguard the public health. Speaking generally, the Northern Sudan, under normal conditions is, as already stated, not an unhealthy country, albeit on account of its great summer heat, dryness of atmosphere, and abominable dust-storms or haboubs, it is trying to the nerves and tempers of Europeans. Still, along the Blue Nile malaria occurs, and it is also common during the rainy season throughout the Central Sudan and may assume epidemic proportions, while many other tropical maladies exist, amongst them leishmaniasis and schistosomiasis. In the south, and notably in the Bahr-el-Ghazal Province sleeping sickness has proved a cause of anxiety, owing partly to the proximity of the French and the

Belgian Congo, and of recent years its menace has become more insistent.

Another disease, alike common and crippling, is yaws. Until recently little had been done to cope with it, but now many sufferers obtain relief owing to the establishment of a hospital steamer, the *Lady Baker*, which plies upon the White Nile and its tributaries, is well equipped, and has proved a boon to the wild Nilotic tribes, who are the victims of many maladies. No greater civilising power could be devised than a vessel of this kind, and it is interesting to note that the Belgians, quick to realise its importance, are placing its counterpart on the Congo. It is to some extent the lineal descendant of the floating laboratory, the first of its kind, which serves as an auxiliary to the Wellcome Tropical Research Laboratories of the Gordon Memorial College, Khartoum.

In the earlier days the sanitary control of the whole country, with the exception of Khartoum, was vested in the Principal Medical Officer of the Egyptian Army, who had, as advisory bodies, a Central Sanitary Board and a Sleeping Sickness Commission. His staff consisted of both military and civilian medical officers, the work of the latter being confined to the northern and more settled portions of the country. The health of the capital, however, was placed under the charge of a Medical Officer of Health, who was not an official of the Medical Service, but was responsible to the Governor of Khartoum. At a later date a Civil Medical Department under a director was formed, and its inspectors looked after sanitation in some of the northern provinces, while medical officers of the Egyptian Army, British, Syrian, and Egyptian, continued responsible for the care of the public health in the remainder of the country. Gradually the scope of the Civil or Sudan Medical Department, as it was called, extended, and other changes took place, the Sleeping Sickness Commission becoming merged with the Central Sanitary Board, and eventually the Medical Officer of Health of Khartoum and his staff became officials of the Medical Department. The latter is now responsible for sanitation over a large part of the territory, but medical officers of the Egyptian Army still exercise control in certain districts. The hygienic history of the Sudan indeed exemplifies what has occurred in many other British possessions: spade work by the Army followed by civil administration. As regards the latter a special feature was the early employment

of qualified British sanitary inspectors. These men have for the most part proved their worth in no uncertain fashion, and the example of the Sudan has been followed by many of our tropical colonies and protectorates. They form a very necessary link between the senior health officers and the native inspectorate, and, once they have become familiar with local conditions and the habits and customs of the peoples under their care, they render a very good account of themselves, and perhaps do more than any one else to further the practical side of sanitation.

Of peculiar interest in the Sudan has been the handling of its sleeping sickness problem. This has for the most part been very efficient, and what promised to be a most serious menace was effectively checked in what used to be the Lado Enclave, but is now known as Western Mongalla. There still exist, however, areas in the Bahr-el-Ghazal and on or near the White Nile which are sources of anxiety. It is indeed fortunate for the native population of these districts that an efficient administration has exercised control and jurisdiction, for otherwise there can be little doubt that large numbers of them would have been wiped out by the deadly trypanosome transported by the tsetse fly, which abounds along many of the water-courses and caravan routes.

The Sudan is not only a good example of a country snatched from savagery but of a vast territory rescued in large measure from the curse of devastating epidemics. In the old days it was famed for its insalubrity. Egyptians were wont to regard an order to serve in its desert wastes, and still more in its distant equatorial provinces, as being almost tantamount to a death sentence, and this largely because of the risks to health and life owing to its unhealthiness. One has only to read the journals of Sir Samuel Baker, the writings of Schweinfurth, the accounts of ill-fated travellers and explorers, the records of military expeditions, to realise what a potent part disease played in hindering development and checking enterprise.

There has been a vast change for the better, but much yet remains to be accomplished and the problem is becoming more complicated. At the present time great irrigation schemes are afoot with the object of advancing cotton cultivation. The necessary engineering works demand an influx of labour from Egypt, and with the labourers there is a risk of the introduction of parasites and of disease. For instance, it has been necessary to take special measures to guard against

ancylostomiasis, which, though it occurs in the Sudan, is not a formidable foe as in Egypt. Again, once irrigation on a large scale is an accomplished fact there will, unless stringent precautions are taken, be grave danger from malaria. In the past certain estates have suffered severely, and a great enterprise may be ruined unless measures of prevention are rigidly enforced.

The Sudan is a Mohammedan country, and here, as elsewhere, the annual pilgrimage of the faithful to Mecca constitutes a potential source of mischief, though happily, so far, cholera has been little in evidence and plague has not gained a footing, possibly owing to the peculiar climatic conditions.

Tuberculosis, syphilis, and leprosy all demand attention, as do occasional widespread outbreaks of cerebrospinal meningitis.

Still, on the whole, the outlook is distinctly hopeful, the more so because the Arab population at least is, speaking generally, alive to the benefits conferred by a sound sanitary policy. It is significant that the natives of the Sudan have contributed largely towards the scheme for that Medical School at Khartoum which is to be a memorial to Lord Kitchener, who brought them the blessings of peace. Amongst its other activities the school will train young Sudanese in those principles of hygiene the application of which means so much to their country, and which has not been the least among the factors that have contributed to its welfare and prosperity since the fall of the Dervish at Kerreri.

We have wellnigh circled Africa. But a short time ago it would have been necessary to include a consideration of public health development and activity in Egypt, which in some directions is a bright page in the annals of British administration, in others a record none too satisfactory. Egypt is no longer an integral part of the British Empire, and so need not be here considered. Nowhere, however, has the importance of the imperial aspect of public health work been more manifest than in the ancient land of the Pharaohs, and nowhere is there a finer record of devoted labour by able men who were compassed by manifold difficulties and who had to combat a variety of diseases and solve a series of problems possibly without a parallel in any other part of the world, for Egypt shares in large measure the pathology

of both temperate and tropical lands. It is an interesting story, one of success and failure, but, taken as a whole, a story of which we have no reason to be ashamed. Those who may care to study it are referred to the article on "The Problem of Hygiene in Egypt" in the work entitled *War Against Tropical Disease*, written by one of the present authors.

It will be interesting to see what will happen in Egypt now that imperial guidance is no longer forthcoming to the extent that was previously the case. Already there are disquieting rumours, and it remains to be seen if the Egyptians are in a position to cope more or less unaided with a situation which has taxed the powers and the patience of those who, from the days of Clifford Lloyd and Sandwith, have sought to combat the forces of dirt, disease, and degradation.

3.—TWO ANCIENT LANDS

Palestine and Iraq.—Although neither of these countries can be considered part of the British Commonwealth, their hygienic development since the Great War, due wholly to British influence, affords a striking example of imperialism devoted to beneficent ends. Palestine, prior to the great upheaval, had witnessed isolated and sporadic efforts at sanitation and medical research, chiefly on the part of the Germans, whose settlement in the country the policy of the Kaiser and his government had encouraged. To a much lesser extent this was true also of Mesopotamia, though here British medical influence had also been in some degree exerted. On the whole, however, both countries had suffered grievously under the backward and unenlightened rule of the Turk, and were in some respects centres of infection and a source of danger to other lands. In both a remarkable change has already been wrought by exceedingly able and devoted work on a comprehensive scale. It is to be feared that when the future fate of these lands is being considered, when they become the sport of politicians and diplomatists, too little attention will be paid to what has been accomplished in them and for them by the British hygienist and to the immense significance of the silent revolution that has been effected.

Yet there can be no doubt that wonderful progress has

been made, and that the medical and sanitary campaign which has been waged and the results achieved have produced a favourable impression on the better educated and responsible sections of their inhabitants. The peaceful penetration of the apostles of hygiene has exercised a far-reaching effect, and has justified the British occupation of these territories as perhaps no other form of activity has done.

Lack of space prevents any lengthy consideration of all the measures taken to remedy the neglect of years, but, as far as Palestine is concerned, a glance at the accompanying graph will show how wellnigh every aspect of public health administration has received attention.

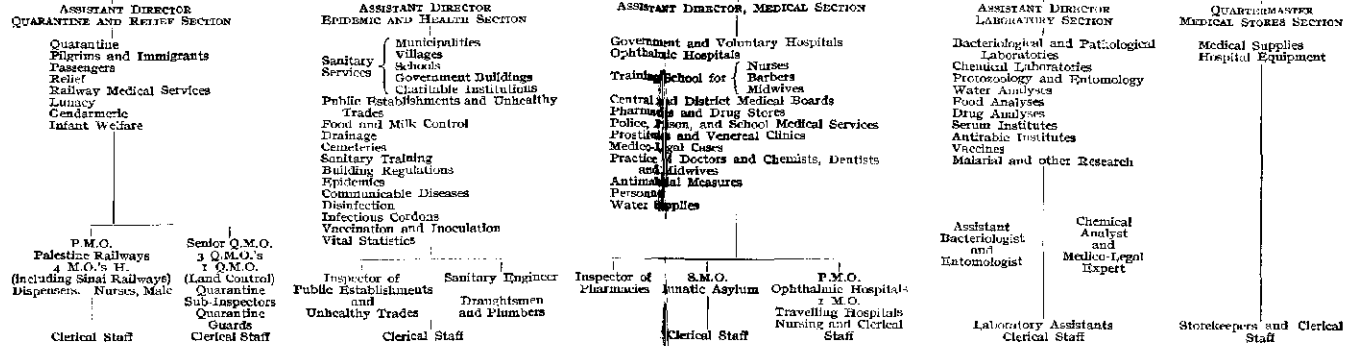
It is taken from the Annual Report of the Department of Health for 1921, and though it is not an exposition of an administration actually in being, for it embodies merely the recommendations of the director, yet a number of the services listed are actually in operation, and it shows the wide view that now has to be taken of health matters in any subtropical or tropical country. The difficulty, of course, is to find money for such extensive operations as are here indicated. Too often they are looked upon as unremunerative, solely because they do not bring hard cash into the Treasury. Yet indirectly, if properly carried out, they are well worth the money spent on them, as will be apparent from a study of the short chapter on the Financial Aspect of Public Health.

Already considerable benefit has resulted from the measures adopted, and the same is true of Iraq, where very similar problems had to be faced, and were faced and largely solved in a manner commanding respect and admiration.

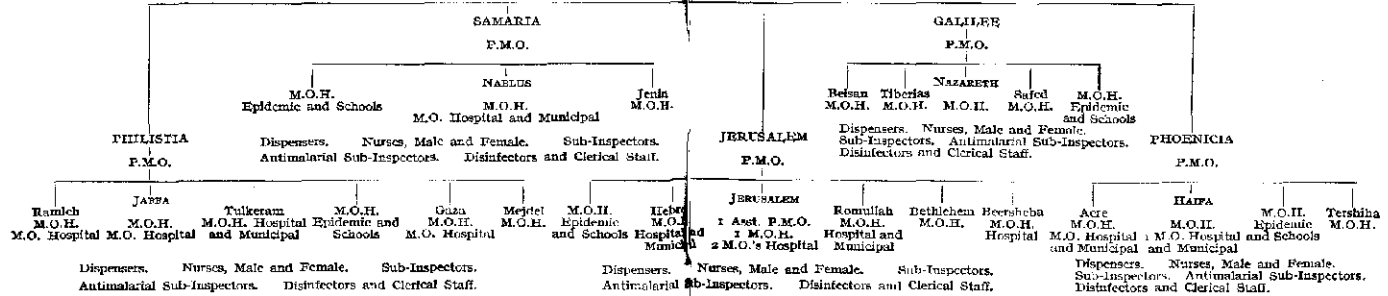
It is to be hoped that never again will these countries be permitted to lapse into the state from which they have been rescued; that, whatever may be their fate politically, care will be taken to see that the foundations which have been well and truly laid are not disturbed, and that an efficient sanitary control will be maintained, together with continued efforts to spread the gospel of hygiene amongst populations which have realised in some measure what such an evangel portends.

DEPARTMENT OF HEALTH

DIRECTOR—HEADQUARTER SECTIONS



DISTRICT GOVERNORATES



4.—AN ISLAND OF THE SEA

Mauritius.—Though but a small and isolated colony, the old Isle de France possesses a sanitary significance out of all proportion to its size and importance, for its hygienic history, alike fascinating and tragic, teaches many lessons which other parts of the Empire may well lay to heart. Here, in a country about the size of Surrey, and greatly favoured by Nature, we can trace step by step the evils and dangers that result from ignorance of science and from neglect of those safeguards which are essential to the well-being of every civilised community. There seems little doubt that long ago Mauritius had some claim to be considered an earthly paradise. Considering that it is situated within the tropics it is blessed with a remarkable climate. Save for its coastal belt, where for a few months in the year the weather is hot and damp, it enjoys climatic conditions not unlike those of the south of England in the summer. It is very beautiful, it is very fruitful, and apart from the visitations of hurricanes it is exempt from most of the disadvantages which beset tropical countries. In the old French days and for many years after the British occupation it appears to have been comparatively free from communicable diseases, and indeed was at one time regarded as a kind of sanatorium. True, it is a moot point whether or not malaria existed in an endemic form prior to the great outbreak of 1867-8, an account of which will be found in the section dealing with that disease. It is possible that the bilious remittent fever which figured annually in the earlier returns may really have been malarial in nature. Beyond any doubt the parasite must have been introduced from India and elsewhere again and again through the agency of infected persons, and it is possible that anopheline mosquitoes did exist on the island in those days and played the rôle of vectors. We cannot say for certain and will now never know, but the view generally held is that *Anopheles costalis* was introduced from Africa some time in the sixties of last century, rapidly multiplied, speedily became infected by feeding on Indian immigrants harbouring the malarial parasite, and spread the disease broadcast, so that thousands perished. It may, of course, have been not a case of the introduction of a mosquito able to serve as a vector but of a mass infection, that is to say, the arrival in the colony of such a great number of

heavily infected persons that anophelines already present also became infected to a degree never before reached.

In any case the result was to ruin the capital, Port Louis, as a place of residence for the white population, to drive all those who could afford to leave it to the central lofty plateau, to render the whole coastal belt unhealthy, and to reduce the energy and vitality of large numbers of the inhabitants. The island has never recovered from the disaster which befell it. Malaria has cost it thousands of lives and many millions of pounds. Accepting the common view of its origin in the island, we possess a proof of the danger of ignorance. In those days the cause of malaria and the method of its transmission were alike unknown. Laveran was a student at Strasburg, and Ross a schoolboy at Ryde. Nowadays we are on the *qui vive* to guard our island possessions, as, for example, Fiji and the Seychelles, from the dread anopheline, and, what is more, we know how to do it. Even if the mosquito did gain a footing on some island hitherto free from it, and malaria made its appearance, the disease in all probability would be nipped in the bud. At any rate we are conversant with methods which, properly applied, could stamp it out before much harm was done.

Again, take the cholera outbreaks which scourged the colony on several occasions. Here also the infection was introduced, and for lack of knowledge this introduction was not prevented and the disease, having established itself, ran riot because its cause and method of spread had not been determined. Indeed we find preventive measures taking the form of thrusting innocent pigs into sacks, carrying them out to sea, and drowning them. Why cholera, once introduced into the island, ever disappeared from it is somewhat of a mystery, for by the time of the later outbreaks at least conditions had become favourable for its persistence. In other words an insanitary state had been established. This was no doubt in part due to the influx of natives from India and the natural increase of the Creole population. We gather as much from the account of the island given by the Rev. Francis P. Fleming in his little book published in 1862. He was in the colony in 1854, and records his impressions as follows:—

“ The overstocked state of the population, and the want of proper precaution respecting the vital sanitary points of *sanitation and cleanliness* amongst the inhabitants, having unfortunately

tended to foster this virulent disease [cholera] in the colony ; and the recent and more frequent recurrences of its fatal effects lead one to fear that unless very energetic rules be enacted and enforced, and that speedily, it will become endemic in the island, and Mauritius will soon be as noted as India for the prevalence and destructive visitations of the dreaded cholera."

Later he writes :—

" Doubtless, the want of proper attention to sanitary regulations throughout the colony greatly tends to engender and spread these epidemic disorders, and we believe that, were it not for the merciful and providential hurricanes which visit this island and thoroughly sweep and cleanse its surface and dwellings the place would never be without disease ; for a worse-drained and dirtier-conditioned place it has certainly never been in our experience to visit amongst the colonial dependencies of Great Britain. The Creole *boutiques*, or shops, in the rural districts, together with the dwellings, outbuildings, yards, and stables of the lower classes are lined with dirt, whilst the *carriages*, cattle-yards, and premises of the better class of Creole proprietors display the same inattention to habits of cleanliness, neatness, or order. As a rule, applicable to the whole population of the colony, we would say that ' want of cleanliness ' was the great social evil that was most apparent everywhere on this island. Such a want, where there is abundance of water, is most culpable and lamentable ; and assuredly until it be energetically rectified, cholera, typhus, small-pox, and such-like deadly and epidemic pestilences may not only be looked for, but will be found *permanently* existing."

Elsewhere he speaks of the coolies of Port Louis being packed together in their " black towns " amidst surroundings of filth and squalor, while in another place he says, speaking of the island :—

" Everything is imported and nothing seems indigenous, if indeed we except the mosquitoes and the rats which seem to grow out of the soil everywhere."

We have said that in its earlier days Mauritius appears to have been comparatively free from communicable disease. We do well to use the word " comparatively," for even during the first forty years of last century we know from the writings of Andrew Davidson that filth diseases were present. Indeed dysentery, the filth disease *par excellence*, was common while

enteric fever was not rare. As a matter of fact Mauritius even then was going the way of India. The white inhabitants looked after themselves, but the Indians, the Creoles, and the Chinese were permitted to live under shocking hygienic conditions, with their inevitable accompaniment of disease and death. So it went on, and doubtless there was some excuse, for money was often woefully short. The malaria outbreak added to the calamities of the colony and there can be little doubt that malaria masked the incidence of typhoid fever. At the present time the two diseases are confused owing to their frequent close similarity and the paucity of blood examinations as an aid to diagnosis. It is, however, greatly to the credit of Mauritius that it did take steps to improve its hygienic condition. It employed Osbert Chadwick, a sanitary engineer well known in his day, to advise as regards water-supply and sewage disposal, and a certain amount of useful work was accomplished. At a much later period the services of Sir (then Major) Ronald Ross were requisitioned with respect to malaria prevention, and his valuable advice was followed to a considerable extent, with accompanying benefit. Here and there general sanitary activity was displayed, and the establishment of a well-equipped bacteriological laboratory was a notable step in the right direction, though unfortunately it was placed far from the large civil hospital.

Until quite recently, however, despite the efforts of local hygienists the general sanitary state had gone from bad to worse, more especially as regards Port Louis. Faulty housing conditions led to much tuberculosis. Ancylostomiasis had become a veritable, if unobtrusive plague. Favoured by the grossly insanitary conditions associated with coolie labour on the sugar estates and by the dangerous *engrais* system with its broadcast distribution of human excrement as manure, this hookworm disease had increased until in some districts 100 per cent. of the inhabitants were affected. Vitality was sapped, energy lessened, susceptibility to other maladies increased. Plague had become endemic, for the island swarmed with rats. To add to all these troubles a devastating epidemic of influenza killed more than 11,000 people in 1919. Moreover, alcoholism, formerly chiefly confined to the Creole population, spread amongst the Indians with dire effects.

Though doubtless a futile form of mental exercise, it is interesting to speculate on what might have happened had

knowledge and the ability to apply it been forthcoming in the earlier days of the colony. Mauritius being but a tiny island with only one port, it would not have been difficult to prevent the ingress of cholera and plague. Malaria might also have been excluded or scotched while still confined to a small area. The spread of ancylostomiasis might have been checked by proper field sanitation and the comparatively few infected persons rapidly and completely cured by the use of carbon tetrachloride. The incidence of both dysentery and enteric fever might have been controlled by the introduction of proper conservancy methods and protection of water-supplies. Good housing and town-planning might have limited tuberculosis. Even influenza might have been kept at bay by a vigorous quarantine, and efficient segregation might have stamped out leprosy. Wise legislation like that which has now been introduced might have regulated the liquor traffic and prevented much degradation, distress, and disease.

On the contrary, Mauritius, partly through its own neglect, partly from excusable ignorance went, by no means gaily but to some extent unconsciously, on the road to ruin, both hygienically and economically. Happily the accident of war for a brief space rendered the little colony rich as Cræsus, and still more happily it had the wisdom, thanks to the initiative of its governor, to set aside a large sum for sanitary regeneration.

Expert advice was sought, obtained, and has already in some measure been acted upon. It is, however, a stupendous task, though by no means an impossible one, that confronts those who have been made responsible for dragging Mauritius out of the quagmire into which it has fallen and setting it on its feet. It remains to be seen how far success will crown their efforts. Even now there has been a marked change in certain directions, but the prognosis must as yet be cautious, for there are all kinds of difficulties which only those conversant with the local conditions can appreciate.

We have dealt at some length with this aspect of the Empire, partly because one of us is specially familiar with it, partly because it exemplifies almost every feature of public health history in the tropics. Remarkable for its history, scenery, and fertility, this wonderful little island is also remarkable for the number and severity of its sanitary vicissitudes. It has reached a stage when, if it is really in earnest, and will work whole-heartedly, it can retrieve itself and regain

its old-time reputation as a health resort. Let us hope it will accomplish the task and set an example to the world, comparable to that which the Americans displayed when they jinked the Atlantic with the Pacific.

5.—THE MIDDLE EAST

India.—If space permitted an interesting commentary might be written on the hygiene of India before the greater part of it became an integral portion of the British Empire. In some directions, in the great system of caste following the institutes of Vishnu and the code of Manu, the teeming millions of the peninsula had found a measure of sanitary salvation. Moreover, here and there, references occur to the sanitary activities of the English pioneers, as, for example, a few lines in Delis's *Early History and Rise of Calcutta*, quoted by Dr. Sircar in a paper on the *Early History of Cholera in India*. They run as follows :—

“ It appears, from the very commencement of the settlement of the company of English merchants in Calcutta in the time of Job Charnock, that they bestirred themselves in the blessed work of sanitation. Lands were surveyed, plans and maps prepared, roads constructed, jungles removed, steps taken to level the ground, and other sanitary and structural improvements sketched out and taken in hand.”

It is, however, impossible to linger over early days ; indeed it appears presumptuous to attempt in a few pages to trace the progress of sanitation in India even since the middle of last century, the period when serious attention began to be directed to the necessity for hygienic organisation. The account can at the best be meagre, and in reality it is only intended to arouse interest in the subject and to indicate some of the more salient features which have characterised British sanitary administration in a country as large as Europe, if Russia be excluded, and packed with people differing in race, religion, habits, and outlook upon life and death ; a country also of many climates and a multitude of diseases ; a very ancient land full of a wisdom of its own, but which is in process of having grafted upon it western ideas and culture that, so far as hygiene goes, must be applied with care and circumspection if trouble is to be avoided and progress secured.

Several distinct stages can be traced in the sanitary history of modern India. There was the period prior to 1859, when sanitary endeavour of any kind whatever was limited on the one hand to the efforts of individual European civilians to secure comfort and safeguard their health under trying conditions, and on the other to the attempts made by a few medical officers to better the state under which the British soldier had to carry out his duties. Few cared about the main mass of the people; they carried on as of yore. Attention to their simple yet fundamentally sound rules of health doubtless aided them a little in keeping disease at bay, but these interposed only a feeble barrier to the onset of deadly epidemics which swept away thousands and were followed by famine and despair.

Major Cunningham, the Director of the King Institute at Guindy, Madras, has written graphically on the subject. He says:—

“ The large mass of people, living under the most primitive and insanitary surroundings afforded an almost unbounded field for the spread of every kind of epidemic disease. Fevers, small-pox, plague, and cholera, each took a terrible toll from the unfortunate inhabitants who frequently looked upon them as a sign of divine displeasure to be averted by prayers and sacrifices, rather than by precautionary measures. The exact mortality caused by these diseases will never be estimated. Contemporary literature, however, leaves no doubt as to their severity. Of an epidemic of relapsing fever one reads that ‘ of numerous native villages nearly the whole population was ill at one and the same moment,’ and ‘ the banks of the river were covered with the dead and the dying.’ A similar fever in Coimbatore and the neighbouring districts was responsible for the deaths of over 100,000 people between the years 1809 and 1811. I have in my possession a letter written by a relation who was a medical officer in the army of the Marquis of Hastings in 1818. He describes an epidemic, probably cholera, which attacked the force at that time, and, lasting just four weeks, carried off no less than 14,000 persons.”

Before 1859, and even for many years thereafter, the problem, so far as the native races went, had attracted the attention of only a few specially interested in it; hence it was disregarded save when some outburst such as Cunningham describes compelled attention for the time being.

It was otherwise with the alien white man, whether civilian or soldier. He found himself confronted with conditions to

which he was unaccustomed and which rendered him uncomfortable and at times afraid. Hence, if he was a free agent and could act for himself, he remedied this state of affairs by housing himself suitably, employing measures to cool the air, attending carefully to his food and drink, and generally looking after his creature comforts. Even so, he perished in large numbers. Dr. Busted describes how the white citizens of Calcutta in the old days met after the rains under the great banyan tree on the Maidan and congratulated themselves that they still survived. If the European was not a free agent—and the British soldier came under this category—he endured, and, too often, died.

Let us consider a few figures in this connection. Between the years 1817-55 the average death-rate of the British Army in India was 69 per 1000, of which ten only were occasioned by war fatalities. Moreover, a very large number of the deaths, both of soldiers and civilians, were due to preventable disease.

Thus, for every 100 Europeans serving in the Presidency of Bombay between 1830 and 1846 the proportion of deaths attributable to the four endemic diseases was as follows:—

Fevers	23.054
Dysentery and Diarrhœa ..	32.441
Diseases of the Liver ..	9.597
Cholera	10.320

It may be stated that the most common of the fatal liver diseases was hepatic abscess, the direct result of amœbic dysentery.

In the case of the Army, it was largely due to the courage and devotion of Florence Nightingale that attention was at last directed to the death-dealing conditions under which the British soldier lived. Her efforts, joined to those of certain enlightened medical officers, resulted in the appointment of a Royal Commission, 1857, which made very full inquiries over a period of years with a view to the diminution of sickness amongst the troops and the improvement of the health of the general population.

About the time the commission came into being the Commander-in-Chief in India ordered the Senior Medical Officer in all cantonments to perform sanitary duties in connection with them, this being apparently the first *official* recognition of sanitary work in the Army in India.

The commission reported in 1863, and expressed the view that if the insanitary conditions prevailing in stations, barracks, and hospitals were remedied and the habits of the men improved, a fall in mortality to at least 20 per 1000 might be expected. It certainly was not unduly optimistic, as will be seen from the following table :—

YEAR.	DEATH-RATE PER MILLE.			
	BRITISH TROOPS.		INDIAN TROOPS.	
1875-79	20.37	..	19.93	..
1880-84	16.30	..	19.00	..
1885-89	15.11	..	12.90	..
1890-94	15.09	..	13.48	..
1895-99	17.14	..	11.34	..
1900-04	13.03	..	10.87	..
1905-09	8.93	..	6.78	..
1910-14	4.35	..	4.39	..
1915-19	8.23	..	14.02	..
1920	6.72	..	9.81	..

Note that within a comparatively short period after the recommendations of the committee had been carried into effect, a very marked fall had occurred. Note also the improvement following 1905, at a time when our scientific knowledge had greatly increased and was being applied to good effect. Note finally the effect of war conditions on both tables.

So far as general sanitary organisation was concerned, the commission recommended the appointment of a Sanitary Commission for each presidency, and of a permanent advisory board in England in the form of an Army Sanitary Commission, whose duty it would be to advise the Secretary of State for India on sanitary matters.

These recommendations were adopted and acted upon by the government.

After the commission had reported, some advance took place, for in 1864 a Sanitary Act was passed under which a Health Service could function, and in the following year a Town Improvement Act, which amongst other things constituted municipalities, was ratified. About the same time the Sanitary Commission for Bengal advocated the establishment of local boards in all districts for the conduct of municipal and sanitary service, the appointment of health officers, and the adoption of other measures designed to ensure proper supervision throughout the country.

An Act of 1866 contained provisions for the conservancy of cantonments, and in 1867 sanitary *commissioners*, who, as a result of the commission's work had been appointed for the presidencies, were required personally to advise the Government with respect to festivals. In this year also, by which *time* forty-four municipalities had been constituted, the Municipal Act was revised and a registration of births and deaths introduced—a most important step. This was followed by Act XIV. of 1868, instituting lock hospitals and legislating for the prevention of venereal diseases.

Vaccinators were appointed under the Provincial Sanitary Commissioners, and a Sanitary Commissionership with the Government of India was created. This post, however, was later merged with that of Director-General of the Indian Medical Service. Special health officers were appointed for Calcutta and Bombay and eventually civil surgeons were made health officers for the purpose of advising municipalities. Meanwhile sanitary and vaccination staffs became gradually amalgamated. The Madras Presidency, always in the forefront of the battle and well served, first by Surgeon-General Cornish and then by Colonel W. G. King, took a further step when civil surgeons there were made "District Medical and Sanitary Officers," each being given an assistant surgeon to carry out specific sanitary duties.

In 1888 the government drew the attention of local bodies and village unions to their duties in the matter of sanitation, and sanitary boards were formed in every province. All authorities, however, are agreed that rural sanitation made little progress and lagged far behind that of the larger towns. As we shall see, this state of affairs has to a great extent persisted to the present time. An important step was taken by Madras University in 1889, when it arranged to grant a public health qualification to medical men.

The above were the chief landmarks down to the end of the eighties, but though a striking change had been wrought there were still many shortcomings, as Sir Percy Lukis pointed out in his *Memorandum on Indian Sanitary Policy* (1914). These were chiefly due to the grafting on India of western sanitary measures and systems without proper regard to the fundamental differences between western and eastern civilisations and the conditions of life in temperate and tropical climates; also to the fact that the people, uneducated and suspicious, were unprepared for reform or any kind of change.

It was a recognition of these facts that in 1894 led

Dr. (now Sir W. J.) Simpson, at that time Health Officer for Calcutta, to submit to the Indian Medical Congress his scheme for an organised sanitary service for India. The following were its broad outlines :—

1. The complete separation of the sanitation of the Army and of the military cantonments from that of the civil population.
2. The special sanitary training of students in the medical and veterinary colleges and schools of India ; and the affording to other classes of students facilities for obtaining, when desired, special training in sanitary engineering and architecture in the engineering colleges and technical schools.
3. The compelling of each municipality or combination or group of municipalities or local authorities to appoint a health officer after a certain date. Such officer's appointment, pay, leave, dismissal, etc., to be subject to the approval of the Sanitary Commissioner.
4. The formation on every municipal board of a small but special sanitary committee with a medical man, and, when possible, the Civil Surgeon, as president, and the compulsory setting aside annually of a certain sum of money to be placed at the committee's disposal for sanitary work only.
5. The appointment of the Civil Surgeon on a proper remuneration with defined powers as Chief Consultant Officer of the district, and in those places in which he is not available either owing to overwork or other cause, the appointment of a special district health officer.
6. The placing of the local and district health officers in close relationship with the sanitary commissioner of the province.
7. The placing of the provincial sanitary commissioners in touch with the Imperial Sanitary Office.
8. The representation of health matters on the Imperial Council.

Simpson's scheme received the approval of the congress, which recommended its adoption by the government.

Madras was the first of the provinces to prepare and submit a sound plan of organisation, a feature of which was the reasonably good pay suggested for all ranks of the service.

Unfortunately, in 1896 plague invaded India through the port of Bombay, and its incursions and ravages produced so much trouble and dismay that the creation of an executive sanitary service for India was forgotten.

Still, the plague epidemic was not an unmixed evil. It impressed the educated community in India, and, as Sir Pardy Lukis says, "The modern history of scientific sanitation in India may be said to date from the end of last century."

Plague was not the only quickening influence. We have seen how in England the discoveries resulting from medical research gave an impetus to sanitary progress. About this time their importance began to be realised in India. It is true that some notable work had, even from early days, been accomplished in that country. The names of Johnson, Annesley, Ballingall, Twining, Morehead, Martin, Waring, Parkes, Cunningham, Lewis, and Vandyke Carter are rightly held in honour, but these and other able and devoted men laboured under difficulties. Even those, like the last three mentioned, who realised the value of the microscope and were to some extent versed in laboratory technique, enjoyed few facilities and were sometimes looked upon as faddists. So was Ross, who, as the nineteenth century closed, was doggedly working out a problem, the solution of which led to far-reaching results and had an immense influence on the sanitary outlook, not only of India, but of the tropics generally. The appointment of the Plague Commission in 1898 proved another stimulus to action, and a very notable event was the foundation in 1902 of the King Institute for Research at Guindy in Madras. Once again the thin end of the wedge had been driven home, and, where research is concerned, there has been no looking back. It will be convenient here to signalise briefly what has since been accomplished in this direction. At the present time (1923) the following laboratories capable of accommodating research workers are in existence :—

1. Bombay Bacteriological Laboratory, Parel.
2. Burma Pasteur Institute and Bacteriological Laboratory.
3. Calcutta School of Tropical Medicine.
4. Central Research Institute, Kasauli, and Malarial Bureau.
5. King Edward VII. Memorial Pasteur Institute, Shillong.

6. King Institute, Guindy, Madras.
7. Pasteur Institute, Coonoor.
8. Pasteur Institute, Kasauli.

In addition, there are some laboratories connected solely with anti-malarial work, as, for example, that of Lahore, and there are laboratories attached to the larger presidency hospitals and various medical schools. Some research work is also occasionally carried out in the divisional and brigade laboratories of the Army in India.

The chief research institutions are turning out useful work, the results of which are published chiefly in the *Indian Journal of Medical Research*, a valuable production which owes its inception largely to the late Sir Pardy Lukis, a Director-General of the Indian Medical Service, and Sir Harcourt Butler of the Indian Civil Service, who took a keen interest in all matters tending to advance medical and hygienic knowledge.

To their efforts also was largely due the foundation of the Indian Research Fund Association with its Scientific Advisory Board, under the auspices of which much good and practical work has already been accomplished.

Undoubtedly the greatest recent development in India has been the foundation of the Calcutta School of Tropical Medicine with its associated hospital. This important and admirable institution is due mainly to the tireless endeavours of a noted Indian investigator, Sir Leonard Rogers. It stands as a monument to his foresight and gifts of imagination and energy. It was greatly helped by Lukis, who came to his assistance time and again. The idea was first mooted in 1910, but it was not until 1922, that the school with its neighbouring Carmichael Hospital, was formally opened by the Governor of Bengal. It has been conceived on no niggardly scale, and has already made a name for itself in the arena of tropical research. Those who desire further information regarding it and some of the work it has so far accomplished, cannot do better than read the account of the address given at the opening ceremony by its able director, Lieutenant-Colonel J. W. D. Megaw, I.M.S., published in the *Indian Medical Gazette* for March, 1922, and the Annual Report for the same year. The latter is a very interesting and suggestive document, giving an impressive account of team work on a large scale and indicating that this school, in which teaching and research are happily combined, will have far-reaching

effects upon the progress of medical and sanitary science in India.

All the institutes named have, however, contributed their quota to the advancement of knowledge and the welfare of the country; lack of space alone prevents mention of their various accomplishments.

Undoubtedly there has been a great change for the better, but a sound paper by Lieutenant-Colonel J. W. Cornwall, I.M.S., published in 1920, in a special number of the *Indian Journal of Medical Research*, showed the need for further organisation of research work. His article must be consulted for details, but it may be noted that he suggested the formation of a State Department of Medical Research under a director. As he very truly points out, research work must not be confined to laboratories: "Much of the preliminary work must be done in hospitals, and all the completed work which bears on diagnosis and treatment must be finally applied to the human subject." It is proposed that the director should have a council of six directors of laboratories, and that the functions of the department should embrace the following:—

- (1) Devising, organising, and executing set schemes to investigate pressing medical problems.
- (2) Defining the methods of manufacture of and organising the output of the factory laboratories.
- (3) Arranging and supervising the methods employed in provincial testing laboratories.
- (4) Arranging for the training of young medical graduates in general science, technique, and methods.
- (5) Arranging for the training of non-medical laboratory assistants and laboratory attendants.
- (6) Issuing at regular intervals information and extracts from current literature to the various workers.
- (7) Organising medical museums.

As the author says, "The material available in India is unlimited, and it is deplorable that it should be allowed to go to waste."

Effect was given to Cornwall's recommendations as regards the Director of Medical Research, Lieutenant-Colonel E. D. W. Greig, C.S.I., I.M.S., having been appointed to this position in March, 1921. As a preliminary step to taking up his duties, Colonel Greig made a tour round the world, visiting the research institutes of many countries and gaining valuable

insight into methods of organisation and the general prosecution of scientific inquiries. Although the scheme for a council was not definitely adopted, a certain amount of co-ordination was effected, the director inspecting the various laboratories in turn and discussing matters with those in charge. There can be no doubt that these measures stimulated research in India and led to much useful work. Hence it is distressing to find that the Inchcape Commission, intent on retrenchment, has sought to effect an economy by recommending the abolition of the post of director and the removal of twelve officers of the Medical Research Department whose time was wholly devoted to research. It also advocated the abrogation of the Research Fund, representing a sum of five lakhs of rupees (£30,000) a year. So far (July, 1923) the government has agreed to the first and third recommendations. The fate of the twelve research workers remains in the balance. This is the same narrow, short-sighted policy that actuated the Mauritius Royal Commission in 1908, when it advocated the abolition of one of the few scientific assets that colony possessed, the Bacteriological Laboratory, Réduit, and the dismissal of its able director, Dr. Lafont. It is penny wise and pound foolish, and one can only hope that it will be rescinded and a more enlightened view taken of all that medical research means to a country like India.

Reverting to the question of the general sanitary organisation, it may be said that throughout the nineties of last century the Director-General of the Indian Medical Service controlled sanitation, such as it was, save in the large towns where municipalities existed. He was assisted by a statistical officer, and, as Colonel King stated in an able lecture delivered to the East India Association in 1914, the organisation foreshadowed by the Royal Commission and by the Secretary of State was slowly but surely deflected or broken down. In 1906, however, the post of Sanitary Commissioner for the Government of India was revived. This office was at first distinct from that of the Director-General, but in 1911 the two were amalgamated. This year also witnessed what can only be regarded as a retrograde step, for sanitary matters were placed under the Education Department, and this arrangement persisted until recently, when the Education Department ceased to exist. The only change has been one of title, for some two years ago the name, Sanitary Commissioner, was changed to Public Health Commissioner. The duties of this officer are of an advisory nature, and he is



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A clever cartoon from the *Indian Medical Gazette* of June 1923, showing the risk which Medical Research in India runs of being wrecked by the policy of the Inchcape Commission.

chiefly concerned with international questions and those dealing with quarantine. The Sanitary Commissioners with the provinces are now termed Directors of Public Health, and they are to be found in Bombay, Madras, Bengal, Burma, the Central Provinces, the United Provinces, Assam, Behar, and Orissa. They deal with local questions, and their functions are, in the main, advisory, though they have under them sanitary inspectors and vaccinating staffs. A proposal for the provision of epidemiological units such as exist in Egypt, where they have proved their value, was negatived.

From an executive point of view the health of districts is in charge of Civil Surgeons, who are advised by the Directors of Public Health in health matters, as are the Medical Superintendents of jails. These latter and the Civil Surgeons belong for the most part to the Indian Medical Service, being seconded for civilian duties.

In the rural districts statistics are collected by the chowkidars or village headmen, and naturally cannot be relied upon. There is no trained staff for the purpose.

The municipalities existing in nearly all the large towns possess their own Medical Officers of Health, who have sanitary staffs under them.

The recent changes included—

For "Imperial" Purposes :—

- The creation of a Central Imperial Board of Health with advisory functions.
- The conversion of the Sanitary Commissioner into a Public Health Commissioner.
- The conversion of his deputy into a Director of Medical Research, an official already abolished.
- The establishment of a Epidemiological Statistical Office under a Director of Epidemiological Statistics.

For "Provincial" purposes :—

- The foundation of a Department of Public Health.
- The conversion of Sanitary Commissioners into Directors of Public Health.
- The conversion of Deputy Sanitary Commissioners into Assistant Directors of Public Health.

Such, very briefly, is the existing organisation. Fuller information regarding it can be found in Sir Patrick Hehir's interesting book, *The Medical Profession in India*. This appeared in 1923, and it has a chapter devoted to Public

Health Work in India. He enters more into detail than is here possible, and considers especially the question of training for Indians desirous of entering the Public Health Service. Those best qualified to judge, and Sir Patrick Hehir is amongst them, do not regard the existing organisation as satisfactory. What is required is a proper executive service of all ranks, more especially for rural India. The main mass of the revenue is derived from the soil, but the vast majority of the villages receive nothing in the way of sanitary attention and the machinery is not well devised for striking swiftly and surely at epidemics.

When the Education Department was included in the newly formed General Department the latter assumed control of sanitation. The Inchcape Commission actually recommended the abolition of the Public Health Commissioner, a recommendation accepted by the Indian Government but fortunately not by the Secretary of State.

It would seem that the Indian Medical Service with its long history and fine record is coming to an end. Indeed the manifold changes which have marked the last few years in India have rendered it somewhat of an anachronism. What is really required is a Ministry of Health and a separation of curative from preventive work on broad lines, but with the practitioner aiding the hygienist in many directions, as foreshadowed by Mitchell in South Africa (p. 91). The health of India is an imperial matter and must be so considered; but if anything like an Imperial Sanitary Service is founded it must be remembered that it cannot be of a homogeneous nature, for throughout India there is so much variation in language, habits, and religion that the transfer of an official from one part to another would prove unworkable, as was long ago pointed out by Hutchinson and Smith. The organisation of the service would have to be modified in certain directions, but the great matter is to secure independence of executive control and a position which cannot be assailed with impunity.

A sound organisation, an ample allocation of funds, and active executive work are all necessary, but still more is required; unless some kind of sanitary education can be provided for the people it is to be feared that progress generally will be slow, although epidemics may be mastered and much of value may be accomplished in various directions. It must be remembered that the superstitions and inertia of ages cannot be easily dispelled.

Here is what Dr. Peter of the Red Cross recently said about the Indian Medical Service :—

“ It is a health machine which it has taken many years to build up. Some of the great medical discoveries of the times have been made by men in that service. I noted the feeling of pride which men took in that organisation, and even if you were to see no more than I saw, you would agree that on the whole it was a very fine public health machine, perhaps the finest to be found anywhere in the Orient.”

There is much here that is very true, though possibly Dr. Peter did not become fully acquainted with some of the defects which have been here considered. He was impressed, but he confessed himself surprised and disappointed at the results achieved. In his opinion religious, or rather sectarian practices are the chief obstacles in the way of setting higher standards of health for the Indian people. As he remarks : “ Religion kills more people in India to-day than the British public health machine could save if it were trebled in size or strength.” He goes on to say that “ the greatest means for advancing public health in the Orient at the present lies in actual demonstration and education.”

Few will deny the truth of this assertion, and, though perhaps Dr. Peter was not aware of it, the need has been recognised, as the perusal of the following note culled from the *Indian Medical Gazette* for August, 1922, will show :—

“ The Government of the United Provinces has instituted a Hygiene Publicity Bureau, and has commenced a Hygiene Publicity Campaign. It has long been felt that steps must be taken to familiarise the general public with the knowledge of how to protect themselves against epidemic diseases ; and that no general advance in public health can be attained until people are educated in rural and municipal hygiene and are prepared to bear the expense of hygienic and anti-epidemic measures. The publicity scheme consists of popular lectures, magic-lantern demonstrations, and the distribution of illustrated booklets and posters. Small, well-written, concise and well-illustrated booklets on such subjects as cholera, plague, malaria, tuberculosis, small-pox, etc., have been prepared in English, Urdu, and Hindi. Twenty-five sets of lantern slides have been prepared in connection with each subject ; and twenty-five sub-assistant surgeons in charge of travelling dispensaries have been trained in publicity work and posted to the more unhealthy districts. As and when funds become available it is intended to provide materials for

100 lecturers and to produce further booklets and pamphlets dealing with relapsing fever, ancylostomiasis, water and food supplies, village sanitation, etc. Also to provide travelling hygiene exhibitions, establish hygiene museums, and to provide health visitors and midwives.

"The whole U.P. scheme is admirably thought out and well organised. Only when there has been created an intelligent public opinion and a popular demand for improved hygiene will it be possible to obtain the funds necessary for real improvement of the conditions of rural hygiene in India."

Again, in Upper Burma, we find that a "Public Health Society" has been established at Kamaing by C. W. King, a sub-divisional officer. It includes 150 members. Each member subscribes two annas monthly. To each ward village an elder is appointed. This man inspects the condition of houses and premises in his area once weekly. Marks are then assigned to each householder, in accordance with the sanitary conditions found. Each month the members of the society meet, and the question of the connection of mosquito prevalence with disease is explained and other disease tendencies amongst the population are also discussed. At the end of the year the money collected is awarded in accordance with the number of marks gained. The members are expected to keep their houses and premises clean, fill up all hollows, remove all pools or regularly oil them with kerosene, and keep all jungle cut down. The author of the scheme states :—

"I found that it was of no use trying to get the people for their own sakes to keep things sanitary, so I had to appeal to the instinct of monetary gain which is common to most sorts and conditions of men, and through this means to cause them to favour sanitation unconsciously. When the people hereafter find that they possess better health than previously by following the principle of 'prevention is better than cure,' I have no doubt they will be sanitary for their own sakes."

Education on the large scale, however, at the best is a slow process, and there are lives to be saved and, what is perhaps more important, lives to be rendered more happy, more useful and more productive. Hence education, that is to say, sanitary education, must go hand in hand with a well-devised and amply endowed scheme for safeguarding the public health both in urban and rural areas. The best demonstration is successful work in the field and such work can be successful only when the sinews of war are forthcoming

and the ranks, from top to bottom, are fully and fitly filled by men trained in that campaign against disease and death which, if never ending, is yet punctuated by noble victories, provided only it be waged soundly and well and with that enthusiasm which in itself means half the battle.

Shortly after the above was written we received a copy of Dr. N. H. Choksy's excellent paper on *Plague in India*. Its last section is entitled "A Special Service," and sets forth his views as to what should be done in the way of training and education. These are specially interesting in the light of what we have just stated, and we append them here as the opinion of one who has long resided in India and has its welfare greatly at heart.

"Let us now consider the practicability of a scheme for the purpose" (*i.e.* reaching the masses and placing at their disposal means for combating communicable diseases), "a combined general sanitary, preventive and curative agency—a Special Sanitary Service—apart from the existing provision of medical relief, spread broadcast over all India working continuously from year to year.

"I. *Cadre*.—The first essential for such a purpose is an adequate staff of trained men; that could be easily obtained from the large number of medical graduates who pass out every year (for superior posts), and from the men who secure their qualifications from the various colleges, State medical faculties, and examination boards, that now exist in each province and confer registerable diplomas (for subordinate work).

"II. *Schools of Hygiene*.—The second essential is the provision of special teaching centres—Schools of Hygiene, one in each province—where those young men should be put through a practical and theoretical course in the principles of general sanitation as applicable to Indian conditions, and preventive medicine, as applied to the diseases above mentioned. They should also undergo a course of practical training in the treatment of these diseases at special hospitals attached to such schools. The men thus equipped will be the *Envoys of Science and Education*, in the words of Mr. George E. Vincent, President of the Rockefeller Foundation. And in addition to sanitation, preventive and curative medicine, they will require to be trained up in the methods of imparting knowledge in sanitary matters, by lectures, travelling exhibitions, lantern demonstrations, instructions in various languages, written in the simplest and tersest style, and made easily understood even by the most ignorant. Their duties will be mainly educational and preventive during non-epidemic periods—to visit each home in every village, and

every town under their charge, and to impart the lessons of health to the people.

" III. *Provincial Cadre*.—Each province should have a cadre according to its population and requirements distributed in centres—individual collectorates—or a group, working singly or in co-ordination when dealing with large epidemics. The subordinate agency to be supervised by the medical graduates holding special Indian University or English qualifications in Hygiene and Tropical Medicine. And a number of fully equipped flying columns to be kept ready at headquarters of districts and talukas, and despatched immediately on receipt of information of a threatened outbreak, wherever required.

" IV. *Provincial Service*.—This service should be an entirely provincial service, under the control of the Director of Public Health, with one assistant director in each collectorate, and deputy assistants in talukas. These officers should be specialists with practical experience of such work in India, England, or America.

" V. *A Ministry of Public Health*.¹—Each Provincial Government should have a Ministry of Public Health under a minister with secretarial staff and three principal expert advisers: (a) For medical relief (the Surgeon-General); (b) For preventive medicine (Director of Public Health); and (c) For local government (Chief Secretary with experience of local government work).

" VI. The Central Government in the above scheme will not require a special Health Ministry, but there should be a Public Health Commissioner—the abolition of whose post was recommended by the Inchcape Committee without any idea of the important rôle of the office or of the grave international responsibilities attached to his work—also a specialist of high standing—whose duty it would be to devise and formulate the working plans of the New Service, and to co-ordinate the work of provincial officers. Whilst the latter would look to the needs and requirements of their individual provinces, the former would be able to have a close grip over all the comprehensive problems involving India as a whole, and will be the authoritative channel of communication on these subjects between India and the other parts of the world.

" VII. The larger cities and towns, with their departments of Public Health, need not be incorporated with the proposed organisation but they will have to assimilate their lines of work with those of the general scheme. This organisation will thus be

¹ "This proposal was recommended by a Conference of Sanitary Commissioners held at Simla in December, 1920—*vide* Bombay Government Resolution, General Department No. 1024, dated the 10th June, 1922."

restricted to district and country work, *i.e.* to the smaller towns and villages throughout India, where alone there exists a reasonable probability of great and lasting achievements."

Ceylon.—To any one surveying the public health conditions of this beautiful part of the world the hackneyed words of the hymn inevitably recur: "Where every prospect pleases and only man is vile." It is strange that the most highly developed creature in the universe is, at least when in the transition stage between savagery and modern culture, undeniably the dirtiest. Yet such is the case, and in the main it is to be explained by the gregarious habits of mankind. He who has seen the mess which low-class natives can produce in the crowded parts of a great city like Colombo, or even in the vicinity of some congested village, and who for a moment contrasts the squalor and abominations with the fair setting of the town or hamlet will subscribe to the words of Bishop Heber.

As in India, so in Ceylon; at first sight one wellnigh despairs of being able to sow any sanitary seed which will come to maturity, but a study of what has been accomplished, and more especially of what is now being done, engenders a more hopeful spirit. In any case there is not in Ceylon such a density of population as exists in India; the territory is limited and far fewer races are represented. At the same time a very considerable mixture of peoples is found, there being over 9000 Europeans, some 30,000 burghers of Dutch stock and Eurasians, more than 3,000,000 Sinhalese, over 1,000,000 Tamils, and a large number of Moors and Malays. Various religions exist, and, as we have seen, religion has a profound influence on hygiene in the Orient. Hence the presence of Buddhists, Hindus, Christians, and Mohammedans adds complexity to the problem requiring solution. Ceylon is one of the wealthier colonies and therefore has been able to pay considerable attention to medical matters, but while its hospitals and asylums are models of efficiency, its sanitation, more especially in the rural districts, has not received the attention it merits, nay demands. Nevertheless there is evidence that this failing has been recognised, and there is hope for the future.

For over half a century after Ceylon was constituted a separate colony in 1801, the military medical officers were responsible both for the military and civil wants, and, so far as we have been able to ascertain, there was nothing very

noteworthy during this régime beyond the introduction of vaccination in 1802. The island suffered from the usual tropical maladies—notably malaria and small-pox—but, not being densely populated and being to some extent isolated, had not to face any very serious crisis. It always, however, possessed considerable hygienic importance, owing to its maritime position, and its quarantine arrangements required careful supervision.

Some of the earlier records are not without interest. Thus Pridham in his account of the island published in 1849 says :—

“ There is one remarkable fact connected with diseases in Ceylon, that its climate does not breed or tolerate any infectious fever. Typhus and the plague are both equally unknown to the eastward of the Indus. Small-pox is noted as the great cause of depopulation, thanks in large measure to the propitiatory worship of the goddess Patiné, the tutelar deity of the disease.”

Tennent, writing in 1860, has a few notes on personal hygiene, including one significant entry which we italicise, and which, had serious attention been paid to it and similar utterances by other authors, might have had far-reaching results. Here are his rules of health :—

“ Retiring punctually at sunset, generous diet, moderate stimulants, and the daily use of quinine both before and after exposure. These and the precaution, at whatever sacrifice of comfort, to *sleep under mosquito curtains*, have been proved in long journeys to be valuable prophylactics against fever and the pestilence of the jungle.”

In 1869 Loos, a colonial surgeon of the Northern Province, reported on depopulation of the Wannu, pleaded for efficient medical assistance and recommended the adoption of a plan of medical education.

In 1858 a Civil Medical Department was formed, consisting of one Principal Medical Officer and thirty-eight medical officers. It is interesting to note that in 1922 the total number of medical men in government service exceeded 200 and that there was a large nursing staff. A few milestones on the path of progress may be noted, one being the founding of the Ceylon Medical College in 1870, a step originally advocated in 1852. In all probability the report by Loos played a part in bringing about this innovation, but the scheme for the school does not even mention hygiene. In 1873 a Report

on the Reorganisation of the Medical Department was submitted to the Legislative Council, and again it is noteworthy that no reference whatever to hygiene appears in it. The same is true of an inquiry in the same year as to the medical treatment of coolies, save for one entry where an estate manager records the fact that the sanitary condition of his coolies is attended to by their master!

In 1899 the generosity of Mr. Charles de Soysa enabled the Bacteriological and Pasteur Institute which bears his name to be built, a notable event which placed Ceylon in an enviable position and undoubtedly quickened interest in scientific work. An equally important advance took place in 1905, when a special clinic for tropical diseases was established in Colombo. Although the college was chiefly concerned with medical matters, as distinct from sanitary, its presence was the means of bringing to the colony certain men of note; consequently when the inevitable happened, and the sanitary, or rather insanitary, condition of the capital cried aloud for remedy, it was unnecessary for Ceylon to import an expert. Albert Chalmers, whose name, linked with that of Castellani, is so well known in the realms of tropical medicine and hygiene, was on the spot, being Registrar to the Medical College. To him was deputed the duty of making a survey, and his findings were incorporated in his "Report on the Sanitation of Colombo and the Causes of Abnormal Incidence of Specific Diseases in 1906." This well-illustrated document gives an exhaustive account of the deplorable condition into which the city had fallen, although its author is careful to point out that despite manifold defects a great deal of good work had been accomplished by the health officer and his staff, and that the death-rate was not so high as might have been expected. Still, in the light of what had happened, it is sad to read Chalmers's opinion that, if only the suggestions made in 1875 by Dr. Aserappa, the First Medical Officer of Health, had been carried out, Colombo would probably have become a model tropical city.

Overcrowding was one of the worst of the evils noted, and yet in 1897 Dr. Attygalle had issued a warning regarding it. What, however, is to be done when building by-laws are repealed and nothing substituted for them? It is unnecessary to speak of the lack of drainage, of the great sewerage scheme or the extension of the existing conservancy system, of the water supply—a bright spot amongst much prevailing gloom—of the food conditions and so forth. The imperial

note is, however, struck when the author discourses on cholera. The early health reports frequently mention cholera, but this dread disease had ceased to exist in epidemic form, apparently because coolies from India were prevented from entering Ceylon otherwise than via Tuticorin and Colombo; careful medical inspection had been established at Tuticorin, and was backed by sound port sanitary work aided by the presence of an isolation camp. The improvement in water supply had also played a part. A tribute is paid in this and other connections to the good work of the port health officers.

Chalmers advocated the adoption of a "Public Health (Colombo) Ordinance," and had the wisdom to devote a section of his report to the financial aspect of the case. What he says is so very sound and so applicable to many places that it may be quoted verbatim:—

"Why," he asks, "is Colombo in such an insanitary condition? Because of the heavy cost which any scheme to put it into a good sanitary condition will involve. The financial aspect of sanitary improvement is always a serious matter, for health cannot be purchased cheaply. First of all there is the heavy initial outlay, and secondly there is the great annual expense involved in keeping the necessary sanitary apparatus going in proper order. Of the two perhaps the latter is the more important, because unless the plant is kept properly going, it had better never be put down. The initial outlay, in my opinion, should never be paid in the lifetime of one generation, because I believe it to be false finance to cripple the work of one generation by making it pay for larger schemes by which succeeding generations are to benefit, and which I maintain should bear part of the expense of such scheme."

So much for Colombo. It remains to say that the report was not without effect and that the state of the city has materially improved, while its mosquito incidence—a matter to which Chalmers devoted scant attention—formed the subject of a report by James and others in 1914.

The main drainage referred to by Chalmers has been recently completed at a cost of £1,200,000. The scheme was carried out by instalments, and as the first instalment, which dealt with about a quarter of the city, was completed as long ago as 1911 it is now possible to get some idea as to the effect of this work on the health of the inhabitants. A note in the *Journal of Tropical Medicine and Hygiene* for September 1st,

1923, furnishes useful figures, and is here reproduced, though it might with equal, or even greater reason have appeared in the chapter dealing with "The Financial Aspect of Public Health."

"The population in round figures is about 300,000, and the death-rate has fallen from 33 to 27 per thousand, a reduction of 6 per thousand, over a period of ten years.

"It may be reasonably assumed that the rate of sickness has been reduced in approximately similar proportion. Accurate statistics applicable to the tropics are not available, but in England there are records of the large benefit societies, and on the Continent some similar statistics have been kept, dealing with many thousands of persons over a series of years.

"The following table gives the number of weeks of sickness and the number of deaths recorded by three of these societies, with an aggregate of 5,174,960 years of life observed.

	SICKNESS WEEKS.	DEATHS.
Manchester Oddfellows ..	7,022,475	39,061
Hearts of Oak	1,452,106	7,853
Leipzig Krankenkasse ..	1,545,613	8,668
Total, ..	10,020,194	55,582

"These figures establish with remarkable consistency a ratio of 180 weeks of sickness to each death, or say an average of 3.5 adult persons constantly sick to each death.

"In Colombo the reduction in the death-rate represents a saving of 1800 lives, and the above ratio represents 324,000 weeks of sickness saved per annum.

"A week's sickness in the case of the breadwinner may be valued at the rate of his week's earnings, but in any case it cannot be less than the value of his keep, or say 5 rupees a week in Colombo.

"The expenses of a Hindu funeral include carriers, music, bier, burial ground, and entertaining, and vary from 75 to over 600 rupees. A Mohammedan funeral may run to higher figures. As a rough approximation, it may be taken that three or four months' earnings of the deceased will be expended upon his funeral, say an average of 100 rupees.

"Now 324,000 weeks at 5 rupees equals 1,620,000 rupees, and 1800 funerals at 100 rupees equals 180,000 rupees, making 1,800,000 rupees per annum saved upon these two items alone, which represents 10 per cent. upon the total outlay for the drainage scheme.

"This does not constitute the total savings to the community, for nothing has been reckoned for medicines, medical fees, and incidentals, nor has the total outlay for drainage yet come into

full operation. On the other hand, the improvement in health is due to other sanitary and medical measures besides the drainage of the city. There is, however, no doubt that the greater part of the improvement is due to the drainage, as reported by the Medical Officer of Health.

"The point to which particular attention is invited is that the funds allocated to such schemes are stigmatised as 'Unremunerative Expenditure,' because the benefits accrue to individuals and do not appear in the revenue accounts. But here is a concrete instance which shows a more profitable investment than any of the securities of the British Government to-day."

We have left little space for the rest of Ceylon, but unfortunately there is not much of a satisfactory nature to record.

So far as urban areas are concerned, outside Colombo there does not exist any sanitary organisation worth the name.¹ The cry is all for local government and this in a place like Ceylon is apt to sound the death-knell of sanitary progress. As a matter of fact, however, the government itself has had no system of sanitary control save through the government agents in the provinces, who had a multiplicity of duties and, naturally enough, no great interest in sanitation. The only beacon-lights we have been able to note are the activity of the Sanitary Commissioner and the fact that a Government Sanitary Officer has now been nominated to each of the urban district councils. This is a hopeful development while such a sanitary exhibition as that held recently at Gampaha is bound to have an educative effect. It included sections dealing with the prevention and cure of local diseases, sanitation, town-planning, town survey, town lighting, and town water-supply. There were models and diagrams, and indeed the nucleus of a hygiene museum was formed. Let us hope it will become permanent. Prizes were awarded for model dwellings, lectures delivered, and demonstrations given in the field.

The need for such gatherings is apparent when one notes that the subject of malaria was fully illustrated and explained, and remembers that malaria is the greatest of Ceylon's rural problems, that malariologists have been employed upon it time and again, and that it is a cause of debility in 90 per cent. of the agricultural labourers. Ancylostomiasis is

¹ Save in the Western Province, where there has lately been very considerable and gratifying progress in the small urban areas under Sir J. G. Fraser, C.M.G., and in the rural areas under the Sanitary Commissioner.

another potent factor in producing inefficiency, and the Rockefeller Foundation here, as elsewhere in British colonies, has extended a helping hand. It must be clear that Ceylon has still a long way to travel on the sanitary path and that the political situation, as well as the local conditions, militates against progress. In some respects we see in Ceylon a little India, but its comparatively small size is in its favour, and by degrees it should get rid of its trammels and attain a degree of hygienic welfare.

It is chiefly a matter of education, and once the quick mind of the native grasps the real significance of the truths presented to him there will be hope for the future, although, at the present time, those on the spot must encounter much that is disheartening and, like the apostles of sanitation elsewhere in the tropics, must now and then wonder if the game is really worth the candle. Yet such a thought arises but to be banished, for to the sincere disciple of the goddess Hygeia there can be no question as to his duty while his faith rests secure, founded on those principles which have withstood the test of time and which, even in a land like Ceylon, are bound eventually to triumph.

6.—THE FAR EAST

British Malaya.—It would seem that the sanitary history of the various British possessions in Malaya exemplifies what we vainly hope is indeed a truth, namely that nowadays when there is a good deal of money available a fair proportion is devoted to hygienic needs. We have as yet hardly reached the length of throwing out a sprat to catch a salmon—in other words, few of those who control the purse-strings realise that even when funds are woefully scarce it is often a wise policy to give a liberal donation towards the advance of sanitation, inasmuch as such expenditure, wisely utilised, will bring in a rich reward, if only by averting the occurrence of conditions which inevitably lead to heavy pecuniary loss. Still something has been gained if the sanitary service of a colony is no longer in the position of Cinderella, the last to be considered. Hence there is a certain satisfaction in reviewing the trend of events in a place like Singapore, for, *mirabile dictu*, even in the absence of serious epidemics, its rulers realised their responsibilities as regards the public health. Doubtless, however, their action was not altogether altruistic for, though Singapore was mercifully spared severe

outbreaks of communicable disease, its sanitary state at the time when what the Americans would call "big money" was voted for hygienic purposes, had, in some respects, become appalling. This forcible term is used by Brooke, who is the sanitary historian of the great city and port which forms the gateway to the Far East. Moreover, there is the old story of cholera acting as a stimulus, for it was the epidemic of 1851 which resulted in the projection of waterworks for the town. As the same author says: "the unfortunate victims did not die in vain."

Singapore became British in 1819, and, as Brooke reports, its public health was left to look after itself for many years, although it speedily became a very wealthy place with magnificent possibilities before it. Prior to 1887 the Medical Officer of Government supplied such advice as was required, and we gather that he was not inordinately busy. In that year a Municipal Ordinance was passed, and a separate Municipal Health Department established. It will be seen, therefore, that Singapore was a bad starter in the race towards efficiency, although some sanitary laws and regulations came into force for the first time about 1869-70. Still there were some early spasmodic efforts in the direction of improved conservancy. Away back in 1827 a committee was appointed, chiefly for the purpose of getting frontagers to construct their drains. Later, as already stated, the question of water-supply received attention. As is not infrequently the case, the needs of the shipping of the port were given primary consideration, but later a series of schemes was developed whereby eventually the town wells were abolished and their place taken by impounding and service reservoirs. Batteries of filters and pumping stations were installed, there being a gradual extension to meet the increasing demands of the community.

Large sums were spent on these innovations and also upon the markets. So far so good, but the insanitary conditions of China continued to be perpetuated by Chinese immigrants, and no quarantine action of any importance was taken for more than half a century. As a result there were epidemics, fortunately not widespread, of small-pox and cholera. Speaking of quarantine, Brooke has one interesting passage which brings home the responsibilities that one portion of the Empire may shoulder for the sake of another. He comments on the infection of India with plague from Hong Kong, reminds us that the deaths in that country

from 1896 to 1904 from plague totalled over three millions, and speaks of the haunting thought that, had every ship been fumigated properly when passing through Singapore—no vain dream—this waste of life, which by the way, has now increased to eleven millions, might perhaps have been obviated.

It was not till 1889 that any systematic destruction of refuse was undertaken, but since then incinerators have been at work. Sanitary measures, however, did not keep pace with the rapid economic development of the wonderful trade centre which we owe to the patriotism and foresight of Sir Stamford Raffles.

Overcrowding and other evils multiplied to such an extent that the advice of Professor (now Sir) W. J. Simpson had to be sought. We have already noted Simpson's activities, and shall see them again still farther East. He might almost be called the "stormy petrel" of tropical hygiene, for whenever there was "dirty weather" in a sanitary sense, he appeared, though, unlike the wandering bird, he was not merely a herald or indicator of danger, for he suggested how it might best be averted. In Singapore he found the state of things wellnigh beggared description, but happily the lead which he gave was followed. As Brooke tells us, "enormous sums had to be spent in the closing years of the first century of the life of the city to undo the damage caused by the *laissez-faire* policy of previous years." For one thing a sewerage scheme had to be undertaken, a gravitation system combined with pumping being adopted. Town-planning formed a part of the programme, and indeed there has been much activity in various directions, including a campaign against malaria instituted in 1911. It now seems strange to read old reports attributing the fever to rotting pine-apples or the effluvia emanating from decomposing coral at low tide. Brilliant results have followed the anti-malarial campaign, and thousands of lives have undoubtedly been saved.

Along with malaria, pulmonary tuberculosis, dysentery, and beri-beri have always been the chief causes of death, and it may be noted that in Singapore there seems some reason to believe that the last-named is not a diet deficiency disease but a bacterial malady associated with insanitary conditions. At least such is Brooke's opinion, and he is a well-known authority on tropical medicine and hygiene.

Singapore has gained a measure of health at a price—a very heavy price—but the money has been well spent, if

only at the eleventh hour. As to the future, Still declares that the whole island is destined to become urban, and hence there is a great necessity for a continuance of careful town-planning. According to him, half the present city should be demolished to secure light and air and facilities for traffic. He puts in a plea for bold spending, and it will be interesting to observe the response. Meanwhile, Singapore is at present in the public eye owing to the naval dockyard scheme, and it is at least satisfactory to know that a medical officer trained in tropical hygiene will be associated with the engineers entrusted with the undertaking. For once it would seem that the time-honoured motto, "Prevention is better than cure," had been borne in mind, a hopeful, heartening sign.

Regarding the *Federated and Unfederated Malay States* much might be written, for there are many lessons to be learned from a study of what has been there accomplished in the way of medical progress. Yet it is remarkable that in the most recent work on Malaya, that by R. O. Winstedt, published in 1923, there is nothing about medicine and sanitation save a few casual references to sanitary boards. Such an hiatus in a work written by one evidently well acquainted with the country and not neglectful of scientific developments is extraordinary, but it is by no means peculiar, for the layman is often singularly blind to the significance and importance of health conditions. Here, unfortunately, it is not possible to record in fitting detail all that has happened. We must be content to mention a few salient features, and at the outset it should be stated that the Federated Malay States possessed certain advantages. They are a comparatively recent addition to the British Commonwealth, for they date only from 1895. Hence a start could be made under conditions which did not obtain in countries like the west coast colonies, Ceylon, and Mauritius. Furthermore, in their earlier days they were exceedingly prosperous, thanks chiefly to tin and rubber, and hence money was available to a degree calculated to excite the envy of many of our older possessions. It was put to good uses.

In his book, *The Prevention of Malaria in the Federated Malay States*, Dr. Malcolm Watson opens with a fine passage on British administration. He says :—

"Only a generation ago a small band of Britons was sent to Malaya. Utterly insignificant in number, backed by no armed force to give weight to their words, they had strict orders only

to advise the native chiefs, and not to rule. Civil war raged in the land. To take one step from the beaten track was to be lost in a forest, which had held men in check from the beginning of time. They were expected to create order from jungle, and turn strife to peace.

"A hopeless task it might appear; but they brought with them those qualities which have spread the power and influence of Britain throughout the world. In the work of these men will be found the highest examples of the tact, of the scrupulous dealing with the native rulers, and of the sound administration which have built up the British Empire; and the progress they made is almost too great to grasp. They found it a land deep in the gloom of an ever-green forest whose darkness covered even darker deeds; for man fought with man, and almost every man's hand was against his fellow's. During the course of a generation, thousands of acres were wrested from jungle; thousands of people now live in peace and plenty; a railway stretches from end to end of the land; roads, second to none, bear motors of every kind; while chiefs, who had never entered each other's country except with sword in hand, met in harmony in conference with the man whose genius had made Federation possible.

"In Swettenham's *History of British Malaya* will be found the record of this marvellous change; and, with scientific instinct, the author contrasts the condition of the Federated States under British control with that of the other Malay States which were still under Siam and their native rulers. These form a 'control' to the British experiment. To the Federated Malay States, British administration has brought wealth and prosperity to a degree to which can be found no parallel.

"And with wealth has come health. From hundreds of square miles malaria, which formerly exacted a heavy toll from Malay and foreigner alike, has been driven out."

This, however, is but one part, though a most important part, of the story—a story which is a medical Iliad in its way, and shows what can nowadays be done when the right men and ample means are forthcoming.

At an early date, in 1900 to be precise, the Government Institute for Medical Research was established at Kuala Lumpur, and ever since it has carried out work of inestimable benefit to the country. Here it was that the classical researches of Braddon, Fraser, and Stanton threw light on the ætiology of beri-beri, a disease which, next to malaria, threatened the well-being of the native races, and especially that of the industrious Chinese who poured into the states after the

British occupation had become permanent and who are such a valuable asset, particularly in connection with the mining industry. The institute was one of the first to be established in the British tropics for the prosecution of research, and it has certainly justified the wisdom of those who founded it. The record of its manifold activities cannot here be given. It is to be found in the *Studies* which have been issued from time to time, and also in various publications by members of its able staff. It may, however, be affirmed that, quite apart from research, the presence of such an institution, where help is given in the elucidation of clinical cases, serves to raise the whole standard of medical work. It places diagnosis on a sound basis, it stimulates the keen practitioner, it aids the hygienist, it enlightens the medical jurist. In every direction it functions as a centre of light and learning, and indeed is now an absolute essential amongst those forces which determine development and progress.

The medical service of the States was at the outset conceived on broad lines, and, in addition, the numerous estates realised the necessity of appointing medical officers not only to attend their sick employees but to safeguard their health and to advise on sanitary matters. Most important commercial interests were at stake, and happily these evolved at a time when recent discoveries had impressed even financial magnates, trading companies, and employers of labour. Fortunately also the post of District Surgeon of Klang was filled in 1901 by Dr. Malcolm Watson, who, trained at the London School of Tropical Medicine, proved himself a man filled with scientific and hygienic enthusiasm and blessed with an indomitable driving power. He speedily made his presence felt and initiated that long campaign against malaria, which has been the admiration of all who have studied it. He was fortunate in his environment, as the following passage culled from his *Rural Sanitation in the Tropics* indicates: "A proposal was made to government that Klang town should be drained, to test the new-mosquito theory [Ross's]; *and the money was voted at once* [the italics are ours]. Work was straightway begun by the Sanitary Board, and within a couple of years malaria had ceased to be of any practical consequence."

Port Swettenham was then taken in hand and again gratifying results were forthcoming. Thereafter the rural malaria received attention and both at the time when Dr. Watson was a government medical officer and later when he

became attached to the Estates Hospitals' Association his influence made itself felt. Malaria prevention was no easy task in the Federated Malay States, for those responsible found themselves opposed to certain species of anophelines the breeding habits of which had not been fully determined. Hence mistakes were made which eventually had to be remedied. These, however, are matters of local rather than of general interest. In the earlier days there were medical officers scattered here and there and some of these concerned themselves with sanitary work. So far as we have been able to ascertain, matters would proceed smoothly for a time. Then there would be some outbreak of disease, or some specially insanitary condition would be discovered; representations would be made and money would be forthcoming to put things right for the time being. Then everything would jog along as before until some fresh cause for emergency expenditure presented itself. Such an arrangement did not work badly, for the money, of which there was plenty, was usually voted when it was required, but naturally the procedure was wasteful and eventually it was clear that an organised Health Department was required. A scheme was first put forward in 1910, and provided for a small Staff of medical officers qualified in public health and for a Chief Sanitary Inspector. A Committee appointed in June of that year to advise as regards estate sanitation, ratified the proposal and very wisely laid special stress on the importance of supplying the department with adequate means of transport for the purpose of carrying out "the necessary and constant and frequent visits of inspection and investigation." This, it may be said, is a provision apt to be overlooked in the framing of schemes of sanitary organisation, and yet it is one on which much depends. The Department was duly formed, but the possession of a public health qualification was unfortunately not regarded as a *sine qua non* in the case of the personnel selected. The staff was not large enough to cope with the work, and hence from time to time proposals were submitted for increasing it. In 1920, the government agreed to a cadre of thirty-one Health Officers, and eight Chief Sanitary Inspectors, but at a later date the estimates were reduced. At the present time a scheme is under consideration for a reorganisation of the whole Malayan Medical Service, in which, of course, the Health Department will share. In the past there has certainly been a tendency to concentrate on the curative rather than the preventive side and in any

further development due care should be taken that the sanitary branch receives proper recognition and status. At present it is not up to strength, and is handicapped in several directions. Yet its duties are onerous and extensive, as the following outline of its activities will show. It has work in connection with the Labour Code which involves the inspection of estates, and there are no fewer than 1200 of the latter which send in returns. This estate work is quite a special feature in the Federated Malay States, where it is perhaps more highly developed than in any other part of the Empire. The Sanitary Boards Enactments come under its purview; it controls the sale of Food and Drugs; it fights malaria, distributes quinine and destroys mosquitoes; it looks after schools and infant welfare. The general prevention of disease, vaccination and quarantine, are its especial care. It is responsible for the registration of births and deaths, and should safeguard the health of the mining population, which numbers nearly 90,000, but cannot do so for lack of personnel. All these duties can be cited in a few lines of print, but think what they really mean! Consider what is involved in the thorough inspection of even one large estate, an inspection embracing questions of housing, water-supply, conservancy, food, the incidence of communicable disease, the prevalence of vermin, and half a dozen other matters having a bearing on health and consequently on labour efficiency. Take again the work of the great quarantine camp at Port Swettenham with accommodation for 7000 coolies and no fewer than three hospitals, one for general cases, one for cholera, and one for small-pox. Think of what the anti-malaria work means in a huge country, much of it covered with jungle, or even what vaccination work on a large scale entails. As is the case in many of our tropical possessions, the field is enormous and the labourers are few.

Yet the Federated Malay States compare favourably with many other colonies. They have been able to specialise in several directions, as witness the work of the Malaria Advisory Board, and later of the Malaria Bureau, which has now become a part of the Institute for Medical Research. The entomological work done has been of a high order and has been directed towards eminently practical ends. Attention has been paid to housing conditions and town-planning. The States were fortunate in escaping the more direct ravages of war, though naturally they suffered indirectly. Plague has never been a very serious problem in this favoured land which,

though not so prosperous as in its halcyon days, is yet reaping the reward of an enlightened public health policy. No doubt it has had advantages, but it has turned them to good account.

Malcolm Watson, writing in 1921, says :—

“ There is a considerable mass of evidence to show that in the past twenty years, sanitary work generally, and particularly the control of malaria in conjunction with other measures, has saved 100,000 lives in the Malay Peninsula, and an enormous, but incalculable, amount of money.”

Again, when comparing the work in Panama with that in Malaya, he declares :—

“ The work in the two places may be compared to the advantage or disadvantage of either, as the critic may be biased. In truth, they are to be regarded as complementary ; each developing on the lines best calculated to achieve its object in its own peculiar circumstances. They represent different phases or stages in progress towards the time when man shall conquer the tropics by stamping out its diseases ; and these rich lands, many of the most fertile on the face of the earth, shall pour out, in unstinted measure, of their abundance for the welfare of the human race.”

Hong Kong.—Hong Kong is the most important British Colony in the Far East, whether regarded from the naval, the military, or the mercantile aspect.

Probably the first intimation of the value of this outpost of the Empire to reach England was the pronouncement made more than a century ago on the occasion of Lord Amherst's Mission to Peking, that “ in all points, both of facility of ingress and egress, and in its perfectly landlocked situation, this harbour can hardly have a superior in the world.” In fact, the name itself “ Heung Gong ” means “ Beautiful Harbour.”

Not till twenty-five years had elapsed was its incorporation in the British Empire formally notified by Captain Elliot in a proclamation dated January 29th, 1841, though its official cession to the British dates from the signing of the Treaty of Nanking in August, 1842 ; in April of the following year Hong Kong was created a Crown Colony by Royal Charter.

Few, if any, of our colonies have made such rapid progress towards wealth and importance. Victoria, now the chief town, was a barren rock ; the few inhabitants gained a bare

subsistence by fishing, and lived in ramshackle dwellings, constructed of the relics of worn-out junks set up along the fringe of the shore. Of Europeans there were none.

In June, 1841, cantonments were erected for the personnel of the navy and army, sales of land took place and businesses were started. With the influx of labourers and the establishment of shops the barren rock became a hive of industry. The natural result of bringing into close contact large numbers of persons ignorant of the first principles of hygiene, assisted no doubt by a climate which during certain months of the year is far from desirable, was that disease spread rapidly among the military and civilian settlers. Thus, though the troops numbered only 1526 in the year 1843, the admissions to hospital among them during that year are given as 7893, and the number of deaths was terribly high, 440, or one in three and a half. In a private letter written by a resident to a friend in England in 1844, we find the following :—

“ Malignant fever is prevalent and very fatal, nearly one-third of those living in the island died. It is not infectious, but due to want of proper drainage, so that water from the hills stagnated and vegetable mould putrefied ; imprudent exposure to the sun and living in improper localities, and in very insufficient houses are assigned as causes. Houses are scarce, the town extends over a long narrow strip along the shore, inhabitants live at a distance from each other, and the nature of the climate is unfavourable for going out except during the evenings. Among the causes of sickness intemperance holds a prominent place ; spirits are very cheap. Every day people may be seen reeling about under a burning sun, scarce able to stand, and the result is all attributed to the climate In all probability the great mortality in the army has some connection with the same cause.”

The Colonial Treasurer of that time could not find a good word to say of the island, and ended a most lugubrious report by stating that “ there does not appear to be the slightest probability under any circumstances that Hong Kong will ever become a place of trade.” A more far-seeing writer stated, however (in the newspaper, *The Friend of China*) :—

“ For natural position few places in the world exceed this island. It only requires some encouragement on the part of the British Government . . . to draw a great portion of the splendid trade of the Canton River to this island. . . . We venture to predict that provided such a differential duty [one

penny per pound on tea shipped from Hong Kong under certificate was suggested], is granted us and provided all restrictions for a free intercourse with the five ports, with Formosa, with Japan, with Corea and with the coast of China beyond 32° North are swept away, Hong Kong in ten years, as a place of trade will only be second to Calcutta."

How false was the first prediction and how true the second was amply proved by the lapse of time. Hong Kong may rightly take pride in the fact that the tonnage returns for that port show that it holds the world's record, exceeding even that of London or New York, but it may safely be affirmed that it would never have attained this dominant position, unless steps had been taken to ensure a measure of comparative healthiness.

In six years the population increased more than fourfold ; from less than 5000 in 1842 the number recorded in 1848 was 23,872.

One more quotation to show that the thriving colony was not exempt from the growing pains of adolescence. In *The Times* of March 15th, 1859, we find the following :—

" Hong Kong is always connected with some fatal pestilence, some doubtful war, or some discreditable internal squabble ; so much so that, in popular language, the name of this noisy, bustling, quarrelsome, discontented little island may not inaptly be used as a euphemous synonym for a place not mentionable to ears polite."

It is indeed interesting to trace the history of a growing colony, but space precludes our giving more than a hasty résumé of events. A few words on the rapid increase of the population and the development of industries will show how medical and sanitary difficulties arose, and we can then pass on to see how these were met and dealt with.

The Governorship of Sir Hercules Robinson constituted a turning-point in the fortunes of the colony. In 1861 Britain obtained an addition of territory on the mainland—the Kowloon Peninsula—and during that year, among the public works undertaken, was a scheme of water-supply, which reached completion two years after it was put in hand.

The opening of the Suez Canal in 1865 and the establishment of steamer communication with San Francisco gave a further stimulus to trade, aided six years later by cable connection, which was set up between Hong Kong and other

parts of the world—Shanghai, New York, London, Saigon and Singapore. Population continuing to increase with great rapidity, the housing question became acute and has remained so until the present day. Sir William des Vœux draws a graphic picture to illustrate by contrast the advance which had taken place in the forty-five years since the first British occupation of the island :—

“ In place of a bare rock with a fisherman’s hut here and there as the only sign of habitation, and a great sea basin very rarely disturbed by a passing keel, we have a city of closely built houses, stretching for some four miles along the island shore, and rising tier over tier up the slopes of the mountain, those on the upper levels interspersed with abundant foliage ; while on the opposite peninsula of Kowloon and along the whole seaboard are numerous houses, together with docks, great warehouses, and other evidences of a large and thriving population. Again, the silent and deserted basin has become a harbour so covered with shipping that even if a visitor has been round the whole world, he could never before have seen so much in a single *coup d’œil*. At anchor or moving are some forty to fifty ocean steamers, including ships of war, large European and American sailing vessels, and hundreds of sea-going junks ; while in the space intervening and around are many thousand boats, for the most part human habitations, with steam launches rushing in all directions.”

Two main problems have, since the time when the above was written, occupied the attention of the authorities ; first, the housing question and all that this entails in dealing with overcrowding and insanitary areas, and secondly, measures for eradicating plague. The former of these was the prior evil and will be spoken of first ; the latter will take the premier place among the epidemic diseases which have for years afflicted the colony.

In spite of the fact that the chief town is situated on the slopes of the Victoria Hills, and thus has an excellent natural drainage, Hong Kong has had a bad hygienic reputation almost since the time of its first occupation. We need not seek far for the cause. The city sprang up without any plan, devoid of all arrangement, with close intermingling of races, Chinese and Europeans together, the Chinese shops and low-class lodging-houses being erected close behind private European dwellings fronting the Praya. On the sloping heights of Victoria Peak, above the European residences, away

from the more strictly Chinese part of the town, were masses of native huts, themselves overcrowded till they veritably resembled an ant-heap. There were no conservancy methods, no sewers, no privies even; each person deposited his excreta on the hill-sides near his dwelling, trusting to the rains to wash them away, which they did—into his neighbours' water-supply—contaminating the "thousand sparkling rills." The exposed beach, for there was no sea-wall in those days, was grossly fouled between high and low-water mark, by refuse of all sorts washed down the gullies from the hill or thrown out from the houses and left to decay. The tidal current, too, with the contaminations from the numerous vessels in the harbour, from the larger ships to the small junks and sampans of the water-dwelling Chinese—a large and far from inconsiderable community—added its full quota to the unhealthy conditions.

One can hardly imagine what these conditions can have been like at the beginning of the twentieth century. The density of the population exceeded that of all other large towns; Hong Kong had 126 persons per acre, whereas the Administrative County of London, with its proper sanitation, had but sixty per acre, Glasgow sixty-one, Liverpool fifty, and Edinburgh only forty-one. This gross overcrowding was not the sole evil; the hygienic conditions at this time were in a parlous state; the water-supply was inadequate, roads were bad, drainage was almost non-existent, there was great lack of schools, rents were excessive and food prices high. The houses inhabited by Chinese of the poorer classes were lofty compared with the width of the streets and lanes on which they fronted, and there was almost complete absence of light and circulation of air. The formation of these houses has been described in the section dealing with tuberculosis, and need not be repeated. The flats into which the houses were divided were low and devoid of proper ventilation. Many of the houses were (and still are) situated in dark and damp alley-ways, in which the air was foul and stagnant, and into whose gloomy and fetid interiors the sun's rays could not penetrate, so that even in the day-time the occupants had to use lights to enable them to see their way about.

To remedy matters an Insanitary Properties Ordinance was passed in 1899, whereby "all new domestic buildings must be provided with back lanes or back yards varying from six to fourteen feet in width in accordance with the depth of the house." Attempts were also made to limit the then

excessive height of houses. Instead of, as in Great Britain, buildings of greater height than the width of the street on which they are erected being forbidden, under certain conditions houses as high as forty-six feet could still be put up in lanes of a width of only fourteen feet. Further, by the erection of buildings at each end of many private lanes these latter were converted into mere insanitary courts, entered by a passage-way beneath the first floor of these terminal buildings. Some of these may still be seen.

At that time slum houses were not rebuilt until they collapsed with age, and even when that occurred the new erections were but little better than those they replaced.

Drainage, with such a rudimentary system as then existed, was very unsatisfactory; the water-supply was insufficient for flushing and consequently the pipes frequently became choked. The liability to this was all the greater, because not only were the pipes too small, but they were badly laid, with joints leading to settlement of mud and rubbish, while traps and gullies were difficult of access and rarely cleaned. Rotting rubbish and stagnant sewage soon became the hiding-place of rats, which thence found their way into the dwellings and constituted an important factor in the spread of plague. The stagnant pools formed breeding-places for countless myriads of mosquitoes, amongst them numerous anophelines.

The island being small and the population a large and shifting one, with sudden influxes from the mainland, when disturbances arise there, it is a matter of almost insuperable difficulty to remedy the overcrowding. The other sanitary problems have to a great extent been solved. At the present time there are magnificent roads, one encircling the island, others ascending and traversing the Peak, with a broad asphalt surface strong enough to bear heavy motor traffic. The drainage is vastly improved, though the water-carriage system of sewerage is not yet as extensively installed as it might be. Experiments were undertaken in 1920-21 to test whether, in view of the insufficiency of fresh water, sea-water might not be used for flushing; the results of these appeared to be very satisfactory, so that we may look forward to the not far distant future when this troublesome problem will have been solved once and for all.

The present water-supply is ample except in times of prolonged drought, an uncommon occurrence in Hong Kong. There are large reservoirs with abundant filter-beds, under the control of a Public Works Department of the first order,

and regular, frequent analyses of the water are carried out, by which the earliest indications of any falling away from a high standard of purity are detected.

The second of the problems which have taxed the powers of the authorities is that of plague and its eradication. In 1894 "loomed up this ghastly spectre of the plague." There is no record of its existence in the colony prior to this date, at all events in anything like epidemic form. It was introduced probably from Canton and has never since left the island; in fact, Hong Kong itself unfortunately became a focus whence the disease has spread, notably to India. During the first year of its introduction there were 2552 deaths from this disease.

It was for the purpose of investigating this epidemic that Professor Kitasato of Japan proceeded to Hong Kong, where he was enabled to discover the causative organism, the *Bacillus pestis*. Hitherto the general public had been, as has so often been the case elsewhere, indifferent and apathetic, but this outbreak drove them to take steps to put their houses in order. Half measures, however, will never suffice. If Hong Kong is ever to be freed from plague and other diseases associated with dirt, overcrowding, and insanitation, the slums will have to be demolished, the narrow lanes widened, and open spaces provided.

But dealing for the moment more particularly with plague, we see on looking back at those times that the measures undertaken were quite inadequate to achieve their aim. Ships coming from plague ports might be quarantined, but the island was, and is still, constantly liable to new introduction of the disease from Canton, Southern China, Swatow, Amoy, and the Philippines, in all of which it is endemic; moreover, the fact that ships and native craft are arriving at all hours of the day and night at small bays of the island from every direction renders adequate inspection an impossibility, since hundreds of persons whose movements cannot be watched enter Hong Kong from the mainland and from the neighbouring islands. Also, in spite of every effort made through quarantine to render the outside clean, the inside was full of all uncleanness. "Plague baskets" with infected clothes were carried along the streets by coolies who dumped them wherever they might chance to be when they wanted a rest or a friendly chat and gamble with their fellows; they were also carried on the crowded ferries, while Chinese, ill and even dying from plague, were borne in chairs along the public highways.

A few words will suffice upon other communicable diseases before we pass on to give a brief summary of the rise and development of sanitary administration in Hong Kong.

Small-pox is not nearly so prevalent now, thanks to efficient vaccination. In 1888 there was a serious outbreak. Calf lymph is prepared at the Bacteriological Institute, so that an ample supply of fresh material is always at hand.

Cases of cholera are occasionally met with; every precaution, however, is taken, by inspection of ships and bacterial examination of suspects, to safeguard the island, with marked success.

Leprosy is a question of greater moment. When Sir James Cantlie wrote his monograph on this disease in Hong Kong, there was no law against the importation of lepers, begging in the streets was unrestricted, and a large influx of cases took place; men who had been driven from their houses on the mainland resorted to Hong Kong, partly with the idea of obtaining employment in a wealthy and thriving colony, if they could not make enough by begging, and partly, no doubt, in hopes of a cure by European doctors.

No records of the prevalence of this disease have been obtainable for years earlier than 1887, when the Alice Memorial Hospital was opened. At this institution during the succeeding two and a half years, 125 leper patients came for treatment, but this represents only a portion of the lepers dwelling in the island. From the time of the first occupation by the British, leper families were known to be living on the hillsides of Victoria. In 1876 they were expelled to the mainland, and any newcomers discovered to be leprous were similarly banished. How ineffectual these measures proved is evidenced by the fact that 125 were being treated twelve years later, and doubtless many escaped detection in the earlier stages of the disease. It is historically of interest to note that the Chinese had for centuries regarded leprosy as a contagious affection. With respect to Hong Kong, the native Chinese there thought that though it might possibly arise in the island itself, the majority of the cases were imported from the mainland. Those in charge of the Chinese hospital—the Tung Wah—were convinced that it was not only contagious but incurable, and therefore refused admission to such patients, sending them to the Canton leper village. At one time a discussion was held as to the advisability of establishing a leper colony in Hong Kong, but as the probable result would be a large influx of such patients, the decision

was adverse. The leper colony system has been in vogue for many years in China, the government having made provision for a home in every district, the inmates being granted an allowance and given an allotment to till.

The suggestion was next brought forward that, since British subjects who became leprosy (whether Chinese or not) might object to deportation, a leper retreat for these should be established in Hong Kong. As only British subjects were referred to, this measure would dispose of the objection that such an establishment would lead to an influx of lepers from other parts of China. If room could not be found in Hong Kong itself, it was suggested that permission might be obtained from the Chinese Government to utilise one of the many adjacent islands for such a settlement. Nothing further, however, has come of this idea.

In 1918 a serious outbreak of cerebrospinal fever occurred, and owing to the overcrowded state of the poorer parts of the town, claimed many victims. The origin of the epidemic was not discovered. Antiserum was obtained hurriedly from America and Japan, and the preparation of serum was set in train at the Government Bacteriological Institute. The production of this has been maintained, and it has proved most efficacious. In the succeeding years the cases have been progressively fewer and the mortality rate has decreased.

Tuberculosis in Hong Kong has received mention in the section devoted to "Some Imperial Diseases."

Venereal disease is a comparative rarity. The Chinese have a high system of ethics, and their morals afford an example which might well be followed not only in other colonies, but in many towns even of Great Britain itself. A Venereal Diseases Commission, when visiting various parts of the East in 1922, came in the course of their peregrinations to Hong Kong. Fortunately they found very little scope for their energies.

We must now briefly review the progress of sanitary administration in this colony. As already mentioned, in the early days of British occupation, an appalling mortality occurred among both the troops and the civilian population. At this distance of time it is impossible to determine with certainty what was the nature of the "malignant fever," but in all probability it was malaria. A Committee of Public Health was appointed to enforce observance of the elementary

rules of sanitation as known in those days, and hospitals were erected. During succeeding years rulings were promulgated from time to time dealing with health questions, which culminated in the passing of an Ordinance in 1856 modelled on the principles of the London Board of Health. Ten years thereafter a "Medical Inspector of the Colony" was appointed, whose chief duty was sanitary administration. Later, in 1873, he was given as assistant, a Chinese scavenger, and considerably later still, European inspectors. In 1881, as a result of a report made by Mr. Osbert Chadwick, who had been sent out to examine into the sanitary state of Hong Kong, the creation of a proper Sanitary Department was decided upon, and the following year this became a permanent Sanitary Board, working under the Public Health Ordinance of the same year. The board was constituted by four official and six unofficial members; of the latter, four were chosen by the governor (two to be Chinese) and two were elected by the ratepayers. The secretary acted for a time as Sanitary Superintendent, but the duties becoming too arduous, a Medical Officer of Health was appointed. However good in theory this may have been for the control of matters of sanitation, in practice the condition of the town remained so bad that the chief residents presented a petition to the Secretary of State for a Commission to be sent out, accompanied by sanitary experts, to advise what measures should be taken to improve the unhealthy state of the island in general and of Victoria in particular. Accordingly, Professor Simpson and Mr. Chadwick arrived, and in consequence of their recommendations there was passed the Public Health and Buildings Ordinance of 1903. This again not proving entirely satisfactory, another commission, appointed three years later, led to the passing of an Amending Public Health and Buildings Ordinance in 1908. Under this the Public Works Department, which hitherto had had entire control, continued to supervise the water-supply, sewers, public roads, and so forth, while other matters of sanitary importance, such as the construction and alteration of buildings and the abatement of nuisances, were attended to by a Sanitary and Building Board, comprising four sections: medical, veterinary, engineering, and secretarial. The constitution of this Board was the same as that of the previous one, namely, four official and six unofficial members. The Board had power to frame by-laws, which had to be ratified by the Legislative Council. The sanitary staff dealt with the regulation of common

lodging-houses, wash-houses, factories, workshops, the question of overcrowding, and general nuisances.

So great was the improvement resulting from these measures that when Professor Simpson subsequently visited the island he is stated to have declared that "Hong Kong was the best scavenged city in the East."

In 1899 active anti-malarial measures were instituted. These need not be spoken of in detail; they comprise the usual drainage of subsoil and nullahs, filling up of swamps, and so forth.

A Bacteriological Institute with ample accommodation for carrying out both routine and research work was opened in March, 1906. In addition to spacious laboratory room and up-to-date equipment, stables and animal houses were also provided. The preparation of calf lymph was one of the first matters taken in hand, everything necessary being fitted in accordance with the methods employed in the government laboratories in London.

From the very outset this splendid building justified the money spent upon its erection and equipment. The amount of routine work dealt with was large, while research in several directions was undertaken even in the first year of its existence, notably investigations in connection with plague-rats and their fleas, and with the prevalence of parasitic worms in Hong Kong.

The advantages of this foresight in making provision for possible needs in the future and not limiting the equipment to the necessities of the moment were abundantly shown at the outbreak of the cerebrospinal fever epidemic, when the preparation of antiserum was taken in hand without the delay which would have been entailed had not the stables and animal houses been ready for immediate occupation. Yet again, when in 1919, at the instigation of the Governor, Sir Edward Stubbs, the question of inaugurating a Pasteur Institute for anti-rabic treatment was decided, the preparation of material was undertaken as soon as the virus could be obtained; no alteration of the building was required, but merely an adjustment of the rooms already provided. Prior to this any person desiring such treatment had to proceed either to Shanghai or to Saigon; hence it was decided that a colony of such standing and importance as Hong Kong ought to have an institute of its own. The virus for starting this was obtained from Ceylon, and the institute was established in 1920. It immediately proved useful, several individuals availing themselves of it during the first few months.

Hong Kong is well supplied with hospitals. In addition to the Naval and Military Hospitals, there is a large Government Civil Hospital in the town, and the Victoria Hospital for Women and Children, beautifully situated on the Peak, 1000 feet above sea-level. Further, there is the Matilda Hospital for poorer patients, built and endowed by the late Mr. Granville Sharpe, which also occupies an ideal situation on the Peak, with an extensive view of the neighbouring islands and the open sea. There is also in the town a large Chinese hospital—the Tung Wah—at which the patients have the option of being treated either by western methods or their own. Finally, there are two hospitals, the Nethersole and the Alice Memorial, under the auspices of the London Missionary Society.

It was at a meeting held at the last-named on August 30th, 1887, that the Hong Kong College of Medicine first had its inception. This subsequently became merged in the Faculty of Medicine of the Victoria University, Hong Kong, but it must not be forgotten since the late Sir Patrick Manson, the Father of Tropical Medicine, was its first Dean, and Sir James Cantlie was also associated with it from the date of its foundation.

Speaking generally, the sanitary history of Hong Kong may be said to resemble that of Singapore. Its health has been purchased at a price, but, as in British Malaya, once the necessity for expenditure on hygiene was realised, the price was paid with a commendable readiness and without stint. The results are apparent, not only in the records of morbidity and mortality, but in the material prosperity which has come to this island colony of the Far East and given it so remarkable a position amongst the seaports of the world.

7.—THE ANTIPODES

Australia.—Of all the countries which go to make up the British Commonwealth, Australia possibly presents the most instructive, if not the most interesting, example of the influence which hygiene exerts upon a community. For one thing there was at the outset a huge continent very sparsely peopled and blessed in the main with a remarkably healthy climate; for another, a period of rapid development ensued at a time when attention was not focused on questions of

sanitation, and when their paramount importance was not appreciated; for yet another, this stage of ignorance and neglect passed away and was succeeded by great hygienic activity and the prosecution of a progressive policy. In short, within the compass of a century Australia has, within certain limits, passed through the whole gamut of experience which fell to the lot of England throughout several hundred years. But from the Imperial standpoint special significance attaches to that portion of the continent which lies within the tropics. It is exceedingly interesting to note how this part of Australia has been opened up and how views have changed regarding it. Still more interesting is the problem of its future, for this is bound up with the whole question of what is known as "White Australia." Here, as in Kenya, a great experiment is in progress, an experiment in acclimatisation, but one which differs in several particulars from that of the East African Highlands.

There is a certain resemblance between the early days in Australia and those to which we referred when speaking of New Jersey.

At least so one would judge from a letter in the *Lancet* of 1837-8, bearing the somewhat ambiguous title, "Uselessness of Medical Men in Australia." Here is what the writer says:—

"Having recently returned from Australia, where I was persuaded to go as the surgeon of a ship under the assurance of there being a great demand there for medical men . . . permit me to put young men on their guard against such an impudent imposition. The climate is the finest in the world; there is an abundance of everything at a cheap rate, plenty of employment, and the labour is well paid. Raiment and fuel are almost not needed; they have there neither endemics nor epidemics, and the consequence of all this is Health of the Highest Order; and this the more marked from improvements of the health of all immigrants by the long voyage passed through a fine climate all the way, cheerful society, good living, rest, and the hope of bettering their condition; with the novelty of the charmingly changed scene and climate on arrival and thereafter. However, let no man go as a surgeon without ample remuneration, bargaining also to be Brought Back. If he do not this, he must become a clerk or a cattle driver; or he must starve."

Confirmation is forthcoming in a note in the *Lancet* of the following year, which says:—

“ Mr. Wyatt, an English surgeon, formerly in Plymouth, who became a magistrate in Australia, states that he has not found any patients in Australia, either to claim his own attention or that of any townsman who may be qualified to practise medicine.”

Alas! this halcyon state of affairs did not long continue, for ere long the settlers began to crowd together into towns, the towns became cities, and the cities became insanitary, so that when disease was introduced it flourished despite the fine climate and all the other advantages. However, thanks to the efforts of devoted men, for Australia has had her Chadwicks, her Simons, and her Newsholmes, the mistakes of the past are in process of rectification, a new era has dawned, and, aided by the bounties of Nature, disease, at least communicable disease, is being mastered and a health record established which may yet excite the envy and admiration of European communities.

Dr. Cumpston, the Director-General of Health, and Professor Sir Harry Allen, a pioneer in sanitary work, have constituted themselves the historians of sanitary development in the country for whose hygienic welfare the former is now responsible.

Cumpston acclaims Dr. Edward Swarbreck Hall of Hobart as the first Australian sanitarian. He landed in Tasmania in 1833, and from 1854 onwards devoted himself to furthering the cause of hygiene. He was clearly far in advance of his time, especially in the remote antipodes, and he appears to have been as scientific as he was strenuous, a man of lofty and unselfish ideals, whose great desire was to benefit his fellows and whose motto, “ Whatever betide, for the right,” might well be that of every sanitary reformer. Another pioneer, of later date, was Dr. Waylen of Western Australia, not a scientific man like Hall, but clearly an enthusiastic hygienist who, in season and out of season, wrote and reasoned, issued timely warnings, and stimulated or shamed local authorities. Take this quotation from his report in 1882 :—

“ In Perth nothing definite has been arrived at as to what is to be done with the sewage. It is now some seven or eight years since attention was drawn to this subject, and every succeeding year it has been commented on without any practical result. An indisposition to increase the rates on household property would appear to be the great hindrance to its adoption, but the difficulty must be met sooner or later. These remarks

apply with equal force to Fremantle, where the contamination of the wells from organic matter is notorious, producing diarrhœa, dysentery, and other ailments."

It is the same old story. What Western Australia needed was a good-going epidemic, preferably of cholera, the great loosener of the purse-strings.

Other parts of Australia also required some such stimulus, for the usual haphazard development was permitted, and, as Sir Harry Allen states, the aspect of public health in Australia was not encouraging till the latter part of the eighties. To judge from a paper read by Springthorpe, the Lecturer in Hygiene in the University of Melbourne, at the International Medical Congress of Australasia in 1888-9, Sir Harry Allen's statement is on the mild side. Here are some quotations from Springthorpe's paper on "Hygienic Conditions in Victoria."

1.—*Surface Conservancy* is nowhere efficiently carried out, no system of town cleansing is ever attempted. "Everywhere the maxim, 'Own Dirt, No Dirt,' is accepted as an axiom. Individuals and authorities are alike to blame."

Foot-paths are generally untidy, the open drains and gutters are almost always pervious; rights of way dirty and wet. The offshoots of the main streets smell, at night, like badly kept cesspools.

"Round the corner of the imposing Town Hall meanders a rivulet laden with foul odour—it has smelt just the same for some years. . . . It would be interesting indeed to know, in acres, the total area of filth in and around Melbourne, in the shape of dirty rights of way, neglected dustbins, sodden manure heaps, made ground polluted in diverse ways; soil pans in use or empty but dirty; road sweeping, cinder and rubbish heaps, stagnant, foetid drains and the like. And, to crown all, we have converted our beautiful waterway, the Yarra, into a magnified, obnoxious open sewer."

2.—*Drainage*. Total absence of a properly designed system of drainage, alike in country districts, towns, and cities. Subsoil drainage is a thing unknown.

3.—*House Construction*. Owing to the land boom, areas are cut up into "pocket-handkerchief allotments" with streets to match. In nearly all instances no Building Act exists, and no local Board or other authority makes an inspection of the houses thereon constructed. The site

might be town rubbish, wet, undrained land, or corporation tip, even ground into which manure has been trenched. . . . Hurriedly erected tenements closely packed, without drainage, with insufficient ventilation, with damp continually rising, and the terraces abutting upon streets or lanes neither paved nor drained. Some occupants come; the rights of way become accumulations of filth, the closets disgusting and offensive nuisances. "Parliament, in passing the Amending Health Bill, struck out the clauses giving the sanitary authority a controlling power in these important matters."

4.—*Removal and Disposal of Night-soil.* Cesspools and pans. The closets usually too near the houses, the undersoil polluted, no ventilation, receptacle frequently returned dirty; removal at best is weekly, the contents are strewn along the thoroughfares. The Corporation of Melbourne issued a by-law by which closets are to be ventilated and deodorants used, but no attempt is made to enforce it.

5. *Water-supply.* Variable.

(i) Typhoid fever exists to an alarming extent . . . the disease is rapidly increasing. Thus, during the six months ending May 31st, 1889, no less than 5159 cases, 789 of which proved fatal, have been reported to the Central Board of Health.

(ii) Hydatid disease. Victoria still remains the second most infected country in the world.

The lecturer also said :—

"From the medico-legal point of view, he (the Victorian) is found enjoying the benefit of more valuable legislation, perhaps, than is the case in any other colony; but ineffective execution and municipal neglect combine with individual apathy to deprive him of most of its beneficial results."

Some of the legislation may be cited as, for example, the Quarantine Act of 1832, an Act to prevent the adulteration of food, passed in 1865, the Public Health Act of 1888, and, later, an Act to prevent the pollution of the River Yarra.

Victoria was not in any way peculiar. Things were just as bad in New South Wales. At the same congress Morgan drew attention to them, pointing out that while information on public health matters had progressed in the United Kingdom, the sanitary condition of New South Wales was daily degenerating. He demonstrated the factors at work. Although a Central Board of Health existed, with inspecting and advisory functions, there were no local Health Boards.

The actual conduct of sanitary affairs was in the hands of Municipal Councils, who framed by-laws without any special reference to sanitary law and with no skilled advice as to the control of the causes leading to epidemics. These and the suppression of nuisances were actually in the hands of the police. As Morgan says :—

“ The routine of reports, reference to committees, reception of more reports, delay and discussion on adoption have to be undergone, and, in the meantime, the opportunity of dealing with an emergency is lost.”

He concluded a suggestive address as follows :—

“ There is nothing to prevent as perfect a condition of sanitation in the Australian colonies as obtains in England. We have not overcrowding and poverty to contend with, our climate is one of the most healthful in the world, and we have ample means at our disposal. What we require is (1) special legislation ; (2) organisation and co-ordination of authority ; (3) the sympathy and assistance of the public who, at the present time, display an apathy in all matters of sanitation.”

Now Australia has got all three, though the third still requires strengthening and extension.

Even before 1888, Adelaide, Melbourne, and Sydney had begun to take action with a view to lessen typhoid fever, which was then a serious menace as Allen's figures show :—

“ In 1885,” he says, “ the death rates from typhoid per 100,000 of population were as follows : New South Wales, 53.06 ; Victoria, 43.48 ; Queensland (and this is noteworthy), 169.90 ; South Australia, 45.34 ; Western Australia (1886), 32.84 ; Tasmania, 22.42. The rate for Sydney was 71.31 ; for its suburbs, 85.28 ; for country districts of New South Wales, 42.10. For Melbourne and its suburbs the rate was 52.98 ; for the country districts of Victoria, 38.27.”

In England and Wales at the same period the rate was only 17.5. It is instructive to follow the proceedings of the Australasian Medical Congress from year to year, for these indicate how, from the end of the eighties of last century, there has been continuous progress, generally speaking on very much the same lines as in the United Kingdom, though in Australia special attention had to be devoted to hydatid disease owing to the prevalence of the parasitic worm which

produces it. Moreover, plague had to be dealt with, and it may here be stated that the investigations of J. A. Thompson of Sydney, in respect of this disease, were of a pioneer nature, a fact which has never been adequately recognised.

As in the homeland, so in this huge country beyond the seas, research advanced hand in hand with hygiene, and eventually extended to those parts lying within the tropical belt. The establishment of an Institute of Tropical Medicine at Townsville in Queensland is a landmark in the medical history of the country. Useful work was here accomplished, some of it having a bearing on the question of acclimatisation of the white man. The activities of Burton Cleland also call for mention, and more particularly his work on the transmission of the virus of dengue or break-bone fever, a distressing and crippling malady, conveyed by mosquitoes, common on many tropical littorals, but especially troublesome at times along the eastern seaboard of Australia.

It is not possible to trace all the varied activities from small beginnings to the great organisation of to-day, but one of the most important, both to Australia and the Empire as a whole, was the Quarantine Service. It developed in quite a remarkable manner, and played a great part in safeguarding the public health both during the Great War and when Australian ports were, as one might say, bombarded by cases of influenza. At all times, too, it has kept a watchful eye on plague, which, as has been pointed out, was never permitted to gain a firm hold. It was the quarantine authority which became the Federal Department of Health, a Department created on March 3rd, 1921, and which commenced its administration four days later under the control of a Commonwealth Minister of Health. We see here an evolution not unlike that which took place in Canada, but in Australia the movement has been on a larger scale, and there is apparently a closer and more workable relationship between the Federal Department and the Central and Local Health Administrations of the various states which go to make up the Commonwealth.

Although the Federal sphere in Public Health did not become an accomplished fact until 1921 there were movements in that direction from a comparatively early date, as the following table of events clearly demonstrates:—

1884.—Following small-pox outbreaks in 1881 and 1884, the New South Wales Government invited the

governments of the other states to send representatives to confer and report on the best means of establishing a uniform and effective system of quarantine for Australia.

It was resolved that there should be Federal Quarantine Stations at Albany and Thursday Island, the ports first reached by vessels making Australia from the westward and the northward respectively, the stations to be under joint control of all states; and that uniform Quarantine Acts should be introduced.

The conference was not productive of any immediate result, nor were any of the resolutions put into practice by the governments concerned.

1896.—Second Australian Conference: dealing with uniformity of practice in regard to quarantine administration, entirely with reference to small-pox.

1900.—Third Australian Conference (Inter-Colonial Plague Conference) dealt with plague which had reached Australia; the Venice Convention of 1897 being taken as the basis of discussion.

1904.—Fourth Australian Conference of the principal health officials in the various States, called by the Prime Minister of the Commonwealth, which had come into being with the Federation of the States in 1901. The Constitution authorised the Commonwealth Parliament to legislate on quarantine. The recommendations of this conference were embodied in the Quarantine Act of 1908 which came into force on 1st July, 1909.

1905.—Fifth Australian Conference dealt with the draft regulations and laid down various details of practical administration.

The Quarantine Act, 1908, was administered by the Minister of Trade and Customs, the execution of the Act being charged to the Director of Quarantine as head of the Quarantine Service. Chief Quarantine Officers were appointed for each State, Queensland and the Northern Territory being incorporated as the North-Eastern Division.

1912.—
1915.— } Quarantine Act amended.
1920.— }

The Director of Quarantine became the Commonwealth Director-General of Health and Permanent Head of a Department, the functions of which have been listed as follows :—

- The administration of the Quarantine Act.
- The investigation of causes of disease and death, and the establishment and control of laboratories for this purpose. The control of the Commonwealth Serum Laboratory, and the commercial distribution of the products manufactured in these laboratories.
- The methods of prevention of disease.
- The collection of sanitary data and the investigating of all factors affecting health in industries.
- The education of the public in matters of public health.
- The administration of any subsidy made by the Commonwealth with the object of assisting any effort made by any State Government or public authority directed towards the eradication, prevention or control of any disease.
- The conducting of campaigns of prevention of disease, in which more than one State is interested.
- The administrative control of the Australian Institute of Tropical Medicine.
- The administrative control of infectious disease amongst discharged members of the Australian Imperial Force.
- Generally to inspire and co-ordinate public health measures.
- Any other functions which may be assigned to it.

The present organisation of the Commonwealth Department of Health is :—

- Minister of Health.
- Director General of Health.
- Chief Quarantine Officers (General) in Local Administrative Control: New South Wales, Victoria, North-Eastern Division, South Australia, Western Australia, Tasmania.
- Division of Marine Hygiene, dealing with :—
 - (a) Maritime Quarantine.
 - (b) Control of venereal disease in the Mercantile Marine.
 - (c) Control of infectious diseases on vessels in Australian waters.

- (d) Medical inspection of passengers and crews of vessels under the Immigration Restriction Act.
- (e) Sanitation in the Mercantile Marine.
- (f) Medical inspection of seamen under the Navigation and Seamen's Compensation Act.

Division of Laboratories :—

Commonwealth Serum Laboratories.

Laboratories in various country centres and at Rabaul, New Guinea.

Division of Tropical Hygiene :—

Australian Institute of Tropical Medicine.

Hookworm Campaign (in conjunction with the International Health Board and the States hookworm control and malaria and filaria survey).

Division of Industrial Hygiene.

Division of Sanitary Engineering.

Each of the States comprising the Commonwealth has, of course, its own Public Health organisation, which administers the Public Health Act within the respective territories. Considerations of space forbid details being given, and in any case such particulars lie rather outside the scope of this work. Those desiring further information may be referred to the Official Year-book of the Commonwealth, which also furnishes much of interest as regards the Inspection and Sale of Food and Drugs, the Milk Supply and Dairy supervision, the Prevention of Infectious and Contagious Diseases, with special notes on vaccination, the manufacture of vaccines and sera, the measures taken to control malaria and schistosomiasis, two diseases representing a legacy from the war, and venereal diseases, for the combating of which a subsidy of £15,000 per annum has been allotted to the various States by the Commonwealth.

There is also a section devoted to a brief consideration of Tropical Diseases and the work of the above-mentioned Townsville Institute. In this connection it must not be forgotten that Australia has a tropical dependency in the shape of Papua. It was here that, at the invitation of the Commonwealth, the International Health Board of the Rockefeller Foundation undertook a hookworm survey in 1916. This was extended to Queensland and eventually to the Northern Territory, a portion of Western Australia, and even to New South Wales. It is very important in relation to the mining industry, and already much has been done,

not only for the miners but for agricultural communities and amongst school children.

It will be seen that in every direction there has been an almost feverish activity. Its latest expressions are perhaps to be found in the arrangement recently made for a conference to be held between Commonwealth and State Health Officers to consider national health questions, and in the appearance of an admirable monthly journal bearing the title *Health*, which cannot fail to spread the gospel of hygiene far and wide.

When one considers that the population of the whole of Australia falls far short of that of London, and when one sees how its welfare is safeguarded on the hygienic side, there can be no surprise at the discovery that remarkable results have been achieved. Allen gives the following facts :—

“The death-rate for the whole Commonwealth in 1920 fell to 10.62, the limits in the several States being 9.35 and 11.19. The rate for England and Wales in 1921 was 12.1. The infantile mortality rate fell to 55.91 in 1917, or about half what it used to be, though the rate has increased again to over 69 in 1919-20. The Commonwealth death-rate from tubercule in all forms fell by 1920 to 6.81 per 10,000 of mean population, a reduction by one-half in forty years. Deaths from typhoid fever in Victoria per 100,000 inhabitants, which numbered 33.0 in 1890-94, fell to 3.7 in 1920 (2.1 in 1919). In the metropolitan district of Melbourne the rate fell in the same time from 43.5 to 1.7.”

On these figures he comments, saying: “These great savings of life imply a manifold reduction of sickness and invalidity with a general rise in the health and the efficiency of the people.” He takes care, however, to show that all is not well. Even the general death-rate, low though it be, is scarcely satisfactory, for it is nearly as high as that for the city of Chicago, and yet Australia is a spacious land, blessed with a fine climate and a cheering sun. New Zealand shows a considerably lower infantile mortality; there is still far too much typhoid fever and pulmonary consumption. The cancer rates are disquieting, the maternal deaths from child-birth by no means insignificant, the prevalence of syphilis is a cause for grave anxiety, and alcoholic excess is far from negligible. It may also be added that, according to Beare, bacillary dysentery is much more common than is usually supposed, and causes a considerable mortality, especially in children.

The path of progress for the future is outlined. It is that which every country must tread if real efficiency and prosperity are to be attained. Hence it may with advantage be considered when we deal with the outlook as a whole. It need merely be said that the very paucity of population in Australia makes it all the more necessary that there should be co-ordinated effort to achieve a position which can assuredly be gained with the knowledge at our command and with the resources available throughout the length and breadth of the great Commonwealth of the South.

New Zealand.—We have had occasion more than once to affirm that sanitary history has a way of repeating itself, and this truth must be only too apparent to any one who has had the patience to peruse these pages. Hence it is not surprising to find that the early history of sanitation in New Zealand was almost a replica of that in Australia.

We have been unable to discover any evidence of early pioneers in hygiene like those in the neighbouring country, unearthed by the researches of Cumpston, but doubtless they existed and passed away "unwept, unhonoured, and unsung." There is usually some one in advance of his times who spends his days as a prophet and priest of the hygienic cult and whose fate is that of other prophets before him.¹

In any case it was not until 1872 that New Zealand received a Health Charter, for in that year its first Public Health Act was placed on the Statute Book of the colony. It would seem that prior to that date there was no systematic or properly co-ordinated form of sanitary administration, though local authorities did exercise some kind of control. "Some kind of control," however, is often little better than none at all, and it is to be feared that the happy-go-lucky method was as much to the fore in the earlier days in New Zealand as it was in other colonies.

Most remarkable, however, is the change which has been effected, a change doubtless due in part to favourable climatic conditions, to absence of overcrowding, to the healthiness of the stock, to comparatively recent development, that is to say, at a time when scientific knowledge was available, but also to the educational and legislative measures adopted by a fine and far-seeing race. As we have said, the first of these legislative measures was the Act of 1872. The date

¹ Some information is, however, obtainable in a book by Dr. R. V. Fulton, entitled *Medical Practice in Otago and Southland in the Early Days*.—*Ide British Medical Journal*, March 29th, 1924, p. 590.

alone shows that the colony was well to the fore, and certainly the Colonial Secretary of the day had enlightened views, for he introduced the Bill in these words :—

“ Health is one of the greatest blessings which any individual or community can enjoy. There was a time when questions affecting the health and physical comfort of the people were received in the legislative halls with covert sneers and careless indifference, but that time has happily passed away. In these days, if I may use the expression, the man who made two blades of health to grow where only one grew before was recognised as in truth a public benefactor. Public health is the cornerstone of all social legislation, and it is becoming more and more the pressing question of the day.”

Enlightened certainly, but, so far as New Zealand was concerned, perhaps a trifle optimistic, for as late as 1889 Leger Erson thus described certain features of the sanitary condition of the colony :—

“ The Local Board of Health does everything. The Medical Officer of Health has no special qualifications, engages in private practice, is paid only when his services are asked for, and his remuneration is less than that enjoyed by a city scavenger.

“ Inspectors of Nuisances are rather general utility men. The duties include: Dog Registrar, Kerosene Inspector, Inspector of Hackney and other carriages, Lodging Houses, and Butcher's Shops, Prosecutor in cases of Breaches of the City By-laws, and Issuer of Licences to Tram-drivers and Conductors. He has also to supervise removal of night-soil, the laying of dust, as well as attend to all correspondence, receive all reports on infectious diseases, and keep a return of the same. Can one wonder if nuisances accumulate somewhat even when the inspector is most anxious and willing to remove them ?

“ A striking example of how a Health Committee may labour in the presence of an epidemic was given during last season when the City Fathers, becoming alarmed at the results of sanitary neglect, actually stopped the publication of the health returns, under the pretext of preventing alarm.”

Investigation showed that the whole system of sanitary administration was faulty, insufficient, and delusive. For example, it was found that typhoid fever was prevalent, and examination revealed the fact that the main sewer was not properly ventilated, and discharged close by the frozen meat works into the harbour, almost adjoining the wharves.

“ Towns are laid out and built without due provision being made for sewerage and water supply. . . . It, indeed, appears

in many instances as if history would repeat itself, and that no awakening would take place until a succession of dire epidemics decimated and horrified a repentant and alarmed people."

"Public buildings are erected without proper sanitary inspection or supervision, with the inevitable result that in a little time they will be condemned, and upon an already burdened colony will fall the ultimate loss."

Wellington insanitary, and zymotic diseases prevalent there.

Dunedin, many infectious cases but no provision for them.

At Napier a swamp improperly drained, schoolrooms wrongly designed for light, etc.

"It is useless to blame this or that for the spread of zymotic disease, when the whole system of sanitary administration is faulty, inefficient, and honeycombed by incompetency. Infinitely better to go at once to the root of the coil and relieve Municipal Councils of duties they should never have undertaken."

The writer, who evidently possessed advanced views, advocated the appointment of a Minister of Public Health, the establishment of a Provincial Board of Health to be elected triennially, and the institution of Local Health Boards for each town or district containing 4000 inhabitants.

Still the failure was not the fault of the Act, which was a very creditable piece of legislation and which was amended in 1875 and repealed by a consolidating Act in 1876. The provisions were excellent but their administration was faulty, as is evident from Erson's revelations and also from the fact that typhoid was prevalent and outbreaks of diphtheria were common.

What has been termed the Second Period in the public health history of New Zealand, a stage of development presenting many important features, dates from 1900. It also was heralded by the passing of a Public Health Act. The first Act had by this time become inadequate and was therefore replaced by an improved consolidated measure, the principal provision of which was the placing of the Department of Public Health under a Minister of Health. The posts of Chief Health Officer, District Health Officers, Port Health Officers, and Sanitary Inspectors were also created. The Chief Health Officer in his first annual report found himself in the proud position of being able to say with justice:—

“ . . . the Public Health Act, 1900, puts the colony in the van as regards the conservation of public health. For many years the medical profession and those interested in health matters at home have been striving, so far in vain, for the appointment of a Minister of Health. By the Act passed last session, this has been accomplished for New Zealand. For the first time in the history of Great Britain and her colonies has the physical welfare of the people been elevated to a first place in the consideration of the government. Foreign Affairs, Mines, and Agriculture have all had their importance marked by the creation of Ministers holding Cabinet rank to look after their interests ; but it has been reserved for New Zealand to create the first Minister of Public Health.”

What, then, had brought about an advance of this nature ? We gather that in part fear, always a prime mover, had been operative ; not, however, fear of cholera, so potent a factor elsewhere, as we have repeatedly seen, but dread of invasion by plague, which had been introduced into Australia. Other forces had also been at work, for Sanitary Commissioners had been appointed by the Governor, and their reports had revealed the need for drastic action. Still, New Zealand is, for all time, to be congratulated on her enterprise and far-sightedness. She reaped her reward. The ranks of the department, now placed on a sound and honourable basis, were filled by many able and devoted men, who laboured unceasingly and strove against very considerable difficulties. At first it was uphill work, owing to the apathy of local authorities. This is clearly indicated in a masterly report by a certain Dr. Makgill in 1901. What he says is so true to-day of many places throughout the Empire that it is well worth quoting.

“ It is impossible to report in a hopeful manner of the administration of the public health at the hands of these bodies (local authorities). Even the largest of them, the Auckland City Council, appears scarcely to realise that they are responsible for the conditions which affect the lives of the people whom they control ; while with a few exceptions the smaller bodies seem totally ignorant of the fact. As regards the larger communities, this is doubtless owing to the general indifference to sanitary laws which has characterised the general public in the past. We are now about the stage of public opinion, at which England was sixty years ago. . . . The chief fault lies in the subdivision of the district into numberless small local bodies, in which the spirit of Little Pedlington is the chief feature, increasing inversely as the size of the community diminishes.”

Bitter indeed must have been the experiences of this stout defender of sanitary faith ere he penned these caustic remarks. It is gratifying to know that he survived to witness the radical change brought about by his efforts and those of his like-minded colleagues. Amongst the latter was Dr. (now Sir) Maui Pomare, the distinguished Maori who pleaded the cause of sanitation amongst his countrymen. They did not labour in vain. There was great activity in public health legislation, and one useful measure after another became law. In 1912 the New Zealand University was given the power to grant diplomas in public health. A campaign against tuberculosis was instituted, and in wellnigh every direction progress was manifest. Then came the war, and those who, like ourselves, had an opportunity of seeing what manner of men New Zealand placed in the field, were able to appreciate what all this work, combined, of course, with other causes, had done for the physique and character of this race from the Antipodes. Yet there was still room for improvement, chiefly because conditions in the Dominion had changed. Moreover, scientific knowledge had advanced, and there was need of simplification in legislation and a greater co-ordination amongst the various forces operating in diverse directions. The world-wide influenza epidemic did not spare New Zealand, and it revealed chinks in her sanitary armour. Again her people rose to the occasion, and a Third Period was inaugurated by yet a third Act, that of 1920, which repealed the Consolidated Public Health Act of 1908 and its amendments. It was framed on broad and comprehensive lines which guide and control the Department of Health in its beneficent work. The department is now under a Director-General, who has a deputy, and it comprises Divisions of Public Hygiene, Hospitals, Nursing, Dental Hygiene, Child Welfare, and Maori Hygiene, each under a Director. The Dominion is divided into Health Districts, each under a Medical Officer of Health, and there is a Board of Health of which the Minister of Health is Chairman. Its duties are in the main advisory, but, under special circumstances, it may exercise mandatory powers. The powers and duties of Local Authorities have been prescribed and regulated, and there are the usual provisions as regards communicable diseases, quarantine, and so forth. There is no need to enter into what are more or less local details, but one point of interest is that in 1921 the School Medical Branch of the Education Department was transferred to the Department

of Health. Another is the fact that mosquito survey work was started in 1918-19 with a view to determining if disease-carrying gnats exist, and this has now developed into a general inquiry into what may be called the medical entomology of the country. Remarkable has been the work and remarkable are the results which have been achieved, greatly aided, no doubt, by those advantages to which reference has already been made.

New Zealand has the lowest infantile mortality in the world. In 1919 it reached its lowest, *i.e.* 45.3 per 1000 births. It is interesting to compare this figure with that of some other countries, for infantile mortality is an important index to the sanitary knowledge of a people. The subjoined table, taken from a report by Woodbury, an American, to the Children's Bureau of the United States Department of Labour, shows how well New Zealand stands in this particular; yet, all things considered, it is doubtful if the record is really better than that of England and Wales, where the circumstances are so different and the factors militating against infant life so infinitely greater.

Country and Year.	Infant Mortality Rate.	Country and Year.	Infant Mortality Rate.
Chile (1919)	.. 306	Denmark (1919)	.. 92
Hungary (1915)	.. 264	England and Wales (1919)	89
Japan (1918)	.. 189	Ireland (1919)	.. 88
Spain (1918)	.. 183	United States (birth- registration area) (1919)	87
Germany (1919)	.. 145	Netherlands (1919)	.. 84
Quebec (1919)	.. 143	Switzerland (1919)	82
Italy (1917)	.. 139	Sweden (1916)	.. 70
Finland (1919)	.. 135	Australia (1919)	.. 69
France (1919)	.. 119	Norway (1917)	.. 64
Scotland (1919)	.. 102	New Zealand (1919)	45
Uruguay (1919)	.. 101		
Ontario (1919)	.. 96		

Sources : Statistical year-books or other official publications of the different countries. Figures are given for 1919, or for latest available year.

New Zealand, however, does not rest content, especially as latterly there has been a slight rise in the rate, and determined efforts are being made to obtain yet greater improvement.

Attention is also paid to what are called Runabouts and those at pre-school and school age. In this connection Dr. F. Truby King, who is the Director of Child Welfare and whose name is a household word in New Zealand, quotes in his report for 1922 this saying of Dr. Almond of Loretto, a great Scottish schoolmaster :—

" We ought to turn out the schoolboy pretty well germ-proof. . . . I only wish there was a word to express that normal and glorious condition of being which ought to be that of the average man and woman. Perhaps in some future century, when the perfection of the human animal is regarded as of equal importance with the perfection of the steam-engine, there will be such a word."

The deaths from puerperal causes are not numerous, the pulmonary tuberculosis death-rate, though considerable, compares favourably with those of England, Scotland, and Ireland. The mortality rate for Epidemic General Diseases is usually very low, and that from enteric fever is specially small (it was only 0.19 per 10,000 in 1921). This is satisfactory, for the prevalence of enteric fever is, generally speaking, a very good indication of the sanitary efficiency of a country.

But the late war has left New Zealand with a wider outlook and heavier responsibilities. She has now to play an ever greater part in Imperial affairs, and has indeed become a small *Imperium in imperio*, for she has had conferred upon her mandatory powers with respect to Western Samoa. It is instructive to note the action taken as regards this new and tropical territory. A Health Order was brought into force in 1921, and a Department of Health was constituted, due provision being made for laboratory work. A Board of Health was also established, and, more recently, arrangements have been made for the visit of an expert to carry out research work. It will be exceedingly interesting to see what New Zealand makes of Samoa from a medical and sanitary standpoint. She has to begin building where the Germans left off. Something may have to be wiped off the slate before fresh entries are made upon it. There can, however, be little doubt that once again New Zealand will rise to the occasion, and, as she has set her own house in order, will not fail to administer her latest possession on lines alike sound and profitable.

8.—THE PACIFIC ARCHIPELAGO

Although in this book we have perforce passed without mention many island possessions, even large and comparatively important territories like North Borneo, we have considered it advisable to touch briefly on certain hygienic aspects of the scattered islands which form the great archipelago of the Pacific Ocean.

At the same time we propose to confine ourselves very largely to those of the Melanesian group, for, more especially perhaps as regards the Solomon Islands, a study of what has happened there is very instructive to the sanitarian, and, furthermore, it serves to inculcate certain special lessons in connection with the hygiene of native races under British control to which, as yet, we have paid but scanty attention. The task of dealing with the subject has been immensely simplified, if not indeed actually made possible, by the recent publication of the very interesting and suggestive *Essays on the Depopulation of Melanesia*, edited by the late Dr. W. H. R. Rivers of Cambridge, and with a preface by Sir Everard Im Thurn. This is a book which every tropical hygienist would do well to read and ponder over, for what is true of the Melanesians is in certain particulars and to a certain degree true of other native races to whom Great Britain stands *in loco parentis*. Moreover, it reveals the fact that one cannot ignore what may be called the hygiene of the mind. This is true as regards white folk in the tropics, especially those in isolated regions, and it forms a not unimportant part of the difficult question of acclimatisation to which we have shortly referred. It is to be feared that in the majority of countries where native races have passed under British sway no one has studied intensively, from the hygienic point of view, the effects which contact with Europeans has had on the native mind. For one thing it is not an easy subject, as in the first instance it requires an intimate knowledge of the mentality of those studied; for another, it has seemed of less importance than the more obvious influence exerted upon the physical well-being of those whose lives and habits have undergone change owing to the coming of the white man. Yet it cannot be doubted that even amongst the least impressionable of such native races subtle forces must be at work on the psychological side. In some instances the

results may be all to the good, in the long run at least, but in others this is not so, and Rivers has shown how deleterious the association may be in the case of a sensitive race like the Melanesians, who possessed peculiar customs dear to them as life itself. As Sir Everard Im Thurn says in the above-mentioned preface :—

“ . . . as a nation, we are now fully realising that, in assuming control of these (tropical) lands, we have saddled ourselves with the duty of providing, as well as may be, for the welfare and comfort of the earlier occupants ; and still more are we only now realising that, in order adequately to fulfil this duty, it is necessary, as a preliminary, to get understanding not merely of the physical requirements, but, at least as much, of the ideas and feelings of these folk of culture quite different from ours.”

This is very true, and it is only when the fact is appreciated and acted upon that the best results will be obtained by the sanitary reformer, for, as Cuvier said long ago, “ the nervous system is at bottom the whole animal,” and there, as we know, are enshrined those delicate and intangible forces which, even in the untutored savage, are the real springs of life.

The story of our dealings with the Pacific islanders is, on the whole, a sad one, although much that is now regretted was done unwittingly and sometimes with the best intentions. Foremost amongst the factors which have brought sorrow and misery to both Polynesians and Melanesians is the introduction of disease. Sometimes the malady has come and gone—a fleeting pestilence—like the epidemic of measles which, running riot amongst the non-immune population of Fiji in 1874-5, slew forty thousand of them. More often the disease has come to stay, has found a lodgment and has continued yearly in an endemic form to claim its victims. Of these, ophthalmia, dysentery, yaws, and the venereal complaints may be taken as examples. In the old days when the “ labour traffic ” was in full swing and the islanders were taken to Australia in large numbers, no one troubled much about the hygienic aspect of this business. It was the slave trade over again, though in an infinitely milder form. Bronchitis, influenza, pneumonia, and whooping-cough are other plagues brought by ships, and tuberculosis, however it originated, has also to be reckoned with. In addition to disease, the introduction of alcohol in earlier times was a

potent source of mischief. Happily its powers for evil have been checked. The adoption by the natives of European clothing wrought grievous harm, and unfortunately the missionaries failed to realise its dangers and so gave no instructions as to how such clothing should be worn and kept clean. Accordingly the custom, once acquired, predisposed to chill, favoured the prevalence of vermin, and aided the spread of infection. In some places also the native has copied the European type of house, and when this is of a bad design and poorly ventilated, as is not infrequently the case, it may become a hotbed of tuberculosis.

More important, perhaps, than any of the above causes of suffering and depopulation, at least in the case of certain of the island groups, has been the interference with native customs and habits. In some places this has increased the amount of venereal disease and led to sterility and other troubles. Here and there the native has taken to European food which does not suit him, and predisposes him to ill-health, but, worst of all, his interest in life has, in many cases, been destroyed, as, for example, by the prohibition of head-hunting, regarding which Rivers gives most interesting details, by the abolition of ancient rites and ceremonies, by the change in the old free life of the island communities. It is a pitiful affair when fine races set out deliberately to efface themselves because the desire to live has left them.

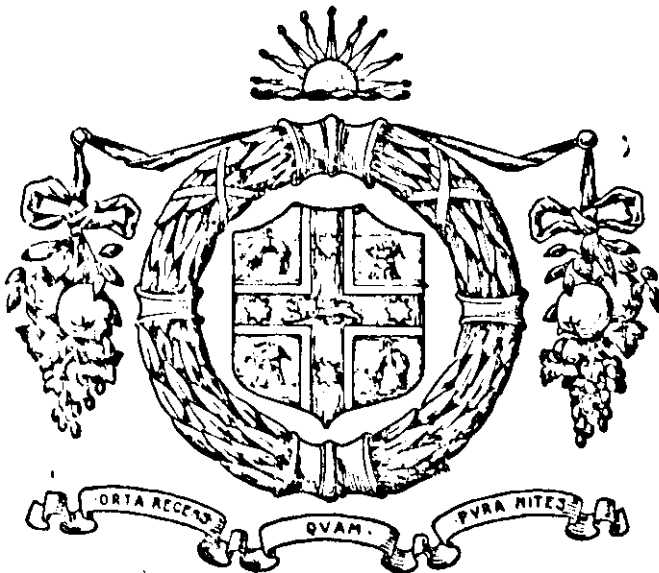
In certain islands, as Rivers says, "Christianity and the occupations connected with it have given the people a new interest to replace that of their indigenous culture." This has saved the situation. He himself suggests remedial measures: the substitution of a pig's head for a human head in the ceremonies connected with ancestor worship, the institution of canoe races to stimulate the building of canoes, an industry which fell into desuetude when head-hunting was stopped, and an endeavour to arouse interest in economic development.

In connection with the prevention and cure of disease, Sir William MacGregor has advocated medical instruction for all missionaries and teachers, and more especially the training of "Native Medical Practitioners" on the lines successfully carried out in Fiji. This is very necessary, for the revenues from the islands are small and it is quite impossible to appoint an adequate European staff. Care should, however, be taken to see that the value of preventive measures

is impressed on all to whom medical training is imparted. Curative and preventive work should go hand in hand, and should develop along the lines of that Maori hygiene which has proved so successful in New Zealand.

There are many other questions which might with advantage be considered, such as the risk of the introduction of infected anopheline mosquitoes into Fiji, the danger from yellow fever now that the Panama route is an accomplished fact, and the effect of ancylostomiasis and filariasis upon labour, as in the Gilbert and Ellice Islands.

Yet on these matters we will not dwell. Indeed our primary reason for dealing with the Pacific Islands at all was to lay stress on that special aspect of public health work which is better exemplified in this part of the Empire than in any other, but which can nowhere be neglected. It is only when the hygienist caters both for the body and for the mind that he is fulfilling his duty properly and may expect the best results from his efforts to benefit mankind.



Arms of New South Wales.

PART II

SOME IMPERIAL DISEASES

THE term, "Imperial Diseases," is, we believe, new to Medicine, and requires explanation. It may be defined, at least for the purposes of this book, as any important communicable malady the presence of which exercises a markedly deleterious effect on the resources of the Empire. No doubt such a definition is open to criticism and possibly the term itself is not too happily chosen, but it is difficult to find one better suited to our purpose and at the same time short and simple.

We have in mind, however, diseases transferable in a variety of ways from the sick person or from the so-called healthy carrier to the sound, existing as endemics, pandemics, or more especially as epidemics, and possessed of such crippling or lethal powers that, taking the British Commonwealth as a whole, they interfere with progress and development, hinder trade and commerce, and occasion monetary loss.

A great number of the ills to which flesh is heir come under this category, but there are certain outstanding diseases which will at once suggest themselves even to the layman, as, for example, tuberculosis, malaria, cholera, and plague. These are certainly imperial in the sense that they are widespread throughout many of the countries which go to make up the Empire, and they also undoubtedly fulfil the above-mentioned conditions. Diseases like cerebrospinal fever, leprosy, yaws, beri-beri, and African sleeping sickness scarcely seem to merit the appellation, although if their histories and effects are carefully considered there is some reason to think that they should not be excluded. To some extent, however, the choice must be an arbitrary one, and as restrictions in space impose limitations, the following list has been selected for brief consideration: ancylostomiasis, cholera, dysentery, enteric fever, influenza, malaria, plague, small-pox, tuberculosis, and the venereal diseases. It will be seen that it contains so-called tropical and non-tropical diseases, but, as a matter of fact, there are few maladies exclusively limited to the tropics, many diseases of hot

climates being not infrequently met with outside the tropics. It has been thought better to arrange the diseases in alphabetical order, for, from the point of view from which it is desired to study them, nothing is to be gained by grouping them in accordance with their ætiology or their methods of spread. Save in the case of the venereal maladies each disease and the factors causing it will be briefly considered, its main features described shortly and in simple language, its distribution within the Empire stated, after which its malign influence on the welfare of the Commonwealth and the measures taken to control it will be reviewed. The success or otherwise of such measures will also be the subject of inquiry and criticism.

CHAPTER I

ANCYLOSTOMIASIS

THIS term does not of necessity connote disease—a fact which must be remembered. Ancylostomiasis merely means the harbouring of one or other or both of two species of nematode worms which are intestinal parasites of man, and which are called respectively *Ancylostoma duodenale* and *Necator americanus*. It would be a very serious matter indeed if every one who was the host of a few of these tiny worms had to be regarded as an invalid, for millions of people are infested, even if the population of the British Empire alone is considered. Happily, when the worms are not numerous, as is frequently the case, there may be no symptoms whatever. On the other hand even slight degrees of ancylostomiasis may produce a certain amount of debility and loss of weight, while the worm infestation is apt to aggravate and complicate any illness from which the host may be suffering. The adult worms, though small, are visible to the naked eye, and indeed, owing to differences in size and shape, male and female forms can be distinguished without a lens by the trained observer. They live for the most part in the central portion of the small intestine where, thanks to the formidable grasping and piercing protuberances with which their mouth capsules are furnished, they attach themselves to the lining membrane of the gut on which they feed, which they slowly destroy and from which they extract blood. There is also some evidence that they can excrete a poison which may have very serious effects upon the human blood. All this is bad enough, but there is reason to believe that through the lesions which they produce, bacterial infection may occur and play a secondary part in the symptomatology of the disease. Not only so, but as the worms appear to move from place to place, seeking fresh pastures, oozing of blood probably takes place from abandoned sites, thus intensifying the anæmia which is one of the features of the condition. One can readily imagine how much damage in several directions results when the walls of the small intestine are studded with many hundreds of these unwelcome

visitors. The worms have a purpose in their wickedness, for they feed to propagate. Male and female conjugate within the bowel, and the fertilised female becomes an egg factory, producing vast numbers of thin-shelled ova, which pass out with the excrement, and, given suitable conditions, develop fully in the soil. They require air, a certain degree of moisture, and a certain degree of heat. If these desiderata are forthcoming, a tiny larva bursts forth from the egg in from two to seven days and feeds greedily upon the fæces. This larval worm sheds its skin as does a snake, and eventually becomes ripe. It then ceases to feed and grow, and makes for earth, moist wood, or water. It is very active, can swim, wriggle, and climb, and its main object is to find a human host. Let it come into contact with the human skin or mucous membrane, and forthwith it becomes a borer, penetrating to the veins and lymphatics. In the case of the skin it takes the easy route by way of a hair follicle. From the veins and lymphatics in the subcutaneous tissue the larvæ, for there is always a more or less massive infection, travel to the intestine by a very roundabout route, via the heart, the lungs, the bronchi, the trachea, the larynx, the gullet, and the stomach. This remarkable journey is believed to occupy seven to ten days. It would also seem that, from the lungs onwards, an alternative route may be followed, that is, by way of the pulmonary vessels to the general circulation and thence to the small intestine, the lining membrane of which the larvæ pierce to take up their habitat as mature worms in its lumen. We do not yet know how long the worms may live in the bowel, but it has been said that 500 of them must be there for six months before their host becomes conscious of their presence owing to the ill effects produced by them upon his health.

In many cases, though we can tell that the worms must be present, owing to the appearance of their eggs in the stools, the symptoms of infestation are absent, or so slight that the persons harbouring the helminths do not know they have been ill until they are cured. In other words, they have got so accustomed to being slightly below par that it is not until they are free from their parasites that they realise how unwell they have really been.

Cases slightly more severe present a certain degree of bloodlessness and symptoms of indigestion, while really bad cases exhibit considerable anæmia, which gradually

progresses in intensity and is accompanied by palpitation and breathlessness.

Another common feature is a disordered or depraved appetite. There is often a craving for earth, and, as a result, more severe infection may occur if the earth eaten contains larvæ. As a matter of fact this geophagy, as it is called, is one of the means whereby children and others first get affected, and in Hunter's *Diseases of the Army in Jamaica*, published in 1788, there is a curious statement that at one time a strange preventive method was in force on some estates, for earth-eating slaves were decapitated after death, a procedure which had a very deterrent effect upon the living.

In addition to digestive disorders there is a physical and mental fatigue. The victim of severe ancylostomiasis is chronically tired, a point well brought out in the excellent American cinema film entitled "Unhooking the Hookworm." Swellings occur about the ankles, the face grows puffy, and there may be dropsy. In white patients the colour of the skin alters. It assumes an earthy hue. In the coloured races, and more especially in the case of children, there may be a somewhat characteristic facial expression.

In addition to these general symptoms the irritation produced by the penetration of the larvæ through the skin may set up a condition known as ground-itch, or in the case of Cornish miners, as "bunches."

Ancylostomiasis is very widespread. As indicated, it occurs in the deep tin-mines of Cornwall, where the conditions of heat and moisture are suitable for the development of the larvæ from the eggs, and where in former times the defective sanitary arrangements permitted infection to become established when the parasites had once been introduced. It is also known throughout the West Indies, British Honduras, and British Guiana. It occurs in all parts of Africa which are under British rule, and is present also in Palestine. It is very prevalent in Mauritius, is extensively distributed throughout British possessions in the East, and also in some of the British islands in the Pacific. In Australia the Northern Territory and Queensland are most heavily infected, but the disease is said to exist throughout the eastern part of the continent. Indeed, it may be stated that there is scarcely any subtropical or tropical part of the Empire which is free from it.

Taking everything into consideration, and excluding tuberculosis and the venereal disorders, which latter are in

a class by themselves, ancylostomiasis is perhaps the Imperial Disease *par excellence*, for even malaria does not, day in and day out, produce such heavy economic loss.

It causes not only physical and mental fatigue, but, in the young, definite physical and mental retardation. Both body and intellect are stunted. It is a veritable blight. Moreover, it predisposes to other diseases and affects the birth-rate adversely. Long before its true nature was discovered its malign influence was recognised, but even after its ætiology had been determined little was done in the way of prevention, though remedies were introduced for its cure. In countries, however, where it is endemic, it is little use freeing the agricultural community from these parasites, for no sooner are these expelled by a powerful vermifuge, such as thymol, oil of chenopodium, or carbon tetrachloride, than reinfection occurs, with the result that time and money have been wasted.

As Peixoto of Brazil says, "So long as there are no provisions for hygiene, reinfestation is inevitable, and begins the very day the cure is complete. It is like carrying water in a basket."

It is clear, therefore, that to achieve results of any permanent value, one must strike at the root of the evil, and this for all practical purposes means that "soil sanitation" must be undertaken on a large scale. When one remembers that the worms do not increase in numbers in the body, and that every worm present there means a fresh infection from without, it is clear that, if those harbouring the parasites can be prevented from polluting the soil and the soil itself can be rendered free from the larvæ, either by natural or artificial agents, the total eradication of the disease is within the bounds of possibility. By "soil sanitation" is meant the hygienic collection, removal, and disposal of human excrement, and it may be said at once that this will never be satisfactorily achieved, in the tropics at least, until progress has been made in sanitary education.

It is only of recent years that determined efforts have been made in this direction, and, sad to relate, the British Empire has not yet fully realised its duties in this respect.

Yet the necessity is urgent, if viewed merely from the standpoint of the economist. Take India, for example. A conservative estimate shows that 45,000,000 wage-earners in that country are infected with hookworm. In 1915 the Statistical Department calculated the average wage of an

able-bodied agricultural labourer in Bengal at 10 rupees monthly, or 120 rupees yearly. Assuming that the average yearly wage of the 45,000,000 infected labourers is 100 rupees each, these men are at present earning Rs. 4,500,000,000 annually. Now the managers of tea estates in the Darjeeling district estimate that the Rockefeller anti-hookworm campaign there, consisting of appropriate treatment, education, and sanitary control, has increased the labour efficiency of the coolies from 25 to 50 per cent.

Suppose that in India generally only 10 per cent. increased efficiency is achieved. Even so the Rs. 4,500,000,000 become Rs. 4,950,000,000, an increase of Rs. 450,000,000 annually. This would cover the whole of the Indian War Loan in but little over three years. Moreover, if the earnings are increased by 33 per cent. as there is every reason to expect would be the case, the amount of the Indian War Loan represents the increased earnings which could be made in one year by the people of India could they all be immediately freed from hookworm. These statements are derived from a paper entitled "Distribution and Control of Hookworm Disease in India," which was published by the International Health Board of the Rockefeller Foundation in the *Indian Journal of Medical Research* for October, 1922. The author goes on to remark: "The pessimist will say that it is not possible to accomplish such a stupendous task. The answer is that it has been done in 30,000 persons with a minimum of friction, and that it can be done in 300,000,000 if it be set about in the proper manner." While in the case of natives, infection is derived from polluted soil, or more rarely from polluted water, it should not be forgotten that a secondary vehicle for the worm embryo is contaminated food, and that, for Europeans milk may be a source of danger. In India this is conveyed from the cow-sheds in the villages in galvanised iron pails, and to prevent splashing a wisp of reed or grass is often placed in the bucket. This wisp may have been fouled. Again, the udders of cows and the hands of the milkers are frequently plastered with infected mud, some of which may find its way into the milk. Yet again, the custom of adding water, and even muddy water, to milk is not unknown in India, and with the water larvæ may be introduced. Milk from native sources should always be boiled.

The example which India furnishes of the necessity for hookworm suppression and the benefits accruing therefrom

might easily be multiplied. Amongst many communities there is a hundred per cent. infection.

Yet at one time, and that not so long ago, no one in the British Empire worried much about the disease from the public health standpoint. So far as India is concerned this was probably due to the fact that medical men were not disposed to regard the hookworm as highly injurious to health. Indeed it is only recently that the seriousness of many forms of helminthic infection has been recognised. Here and there, it is true, some physician more enlightened than his fellows drew attention to the grave effects of ancylostomiasis, but, even so, he usually had in mind the immediate effects upon the patient and not the ultimate results as regards the community.

Even when it began to dawn upon the medical world that hookworm disease was a foe to be fought upon a large scale, the various British Governments did next to nothing, and it was left to the Americans to conceive the idea of a world campaign against the insidious enemy, and, furnished with the sinews of war by John Rockefeller, to embark upon one of the most remarkable enterprises recorded in the history of hygiene. At first, however, the crusade was more medical than sanitary, and though excellent results were achieved they were not lasting, for reasons already stated. Accordingly, soil sanitation became perhaps the most important item in the International Health Board's programme. We say "perhaps," for pride of place should possibly be given to its educational propaganda, since unless the co-operation of the general population is secured but little can be accomplished, and unless the population is enlightened and stimulated co-operation will not be forthcoming.

The Americans, imbued, as they so frequently are, with high ideals in matters hygienic, and having few colonies of their own, sought and obtained permission to commence work in British possessions. They began on a small scale in the West Indies, but have now extended their activities to many lands. Happily they realise to some extent the truth of the saying that people do not value what they do not pay for, and so their method is to arrange that the cost is partly borne by the Rockefeller Foundation, and partly by the country it is seeking to benefit.

Not only so, but they recognise that progress depends upon research; hence they afford facilities for such work, and extend them to British workers. There is something

very fine in the older nation's being helped in this way by the younger, which sprang from it, but separated from it, even if there is something rather humiliating in the way in which the Empire acquiesces in having its very obvious duties carried out by the Republic. Yet it is only fair to remember the vast burden of expense which falls on the shoulders of the British Treasury and the fact that few of our colonies are in a financial position to bear the full strain of extensive work of this nature. Still there should be a larger recognition of the fact that such campaigns pay eventually, and pay in hard cash. At the same time the neglect has not been universal. When Egypt was virtually a part of our overseas possessions, Lord Kitchener in 1913, acting on the advice of the Director-General of the Public Health Department, inaugurated an anti-hookworm campaign, which achieved some success, but was abandoned on the outbreak of the Great War.

In Australia those responsible for the management of the mines, and the miners themselves, have taken such effective precautions that, though the conditions are in every way favourable for ancylostomiasis, infestation does not exist. The examination during 1920 of over 4000 miners and mine employees in South Australia, Victoria and New South Wales, yielded entirely negative results. Moreover, Queensland is taking the matter in hand. But we need not go as far as Australia in search of evidence of progress. It can be found in the case of the Cornish tin-mines, where improved ventilation and the adoption of a bucket system for the collection of excreta have produced a great amelioration, shown by a fall in the incidence of infection from 94 per cent. in 1904, to 6 per cent. in 1920.

Again, in India an Endowment Fund has been established by the Indian Jute Mills Association, and is being devoted to research work on ancylostomiasis.

A vast literature has accumulated on the subject, but happily the Rockefeller Foundation has published a bibliography, so that any one interested in the matter can readily pursue its study. It is impossible here to go into details. Naturally, preventive measures will vary to some extent in different localities and may change as knowledge increases, but the underlying principles will remain the same. They might almost be summed up in the two words cleanliness and boots, for if the soil never became contaminated, there would be no ancylostomiasis, while the valuable protection afforded

by wearing boots has been demonstrated again and again.

The problem of ridding our overseas possessions from the blight of the hookworm, if not a complex one, is yet beset with many difficulties. These, however, are chiefly concerned with questions of administration and finance. We know how ancylostomiasis can be conquered and, amongst certain communities, it will doubtless be effectively controlled at no distant date. Still, further research is required in several directions and, as Clayton Lane has pointed out in an interesting and critical paper on what he calls "The Changing Problem" (*British Medical Journal*, March 31st, 1923), the crying need is for a latrine, simple, cheap, profitable, fool-proof, suitable for the poor hut-dweller. Such has not yet been found and, in addition, certain questions of soil infection and treatment require elucidation, while there are the usual difficulties in handling natives. In the majority of the infected populations the fight can hardly be otherwise than long and stubborn, but, given goodwill on the part of those concerned, and a sound policy, benefit will soon accrue, and eventually we may hope that in many countries where the disease is now rampant it will in the fullness of time become as extinct as the dodo.

CHAPTER II

CHOLERA

IN many instances it may with truth be said that the fear of cholera has been the beginning of wisdom. We have seen how the terror of its repeated visitations drove the people of Britain to remedy the faulty conditions under which they lived, and it is not uncommon to hear disheartened health officers in the tropics declare that there are worse things than a good-going epidemic. By this they merely mean that a few weeks of a severe outbreak of disease will often accomplish what they have been vainly striving to obtain for many a weary year, and of all pestilences cholera is perhaps the most dramatic, the most fear-inspiring.

It is due to the tiny comma-shaped vegetable organism belonging to the class of bacteria known as the vibrios, and is commonly called Koch's cholera bacillus or vibrio. It lives, multiplies, and produces a deadly poison in the small intestine of man, but may also sojourn in the gall-bladder, and when so situated, as we shall see, produce no symptoms.

The usual mode of infection is by drinking water which has been contaminated by dejecta containing the specific organism and derived either from a person suffering from cholera, or from what is known as a healthy cholera "carrier," to wit, a person who harbours the vibrios either in his bowel or his gall-bladder, but who does not present any clinical evidence of the disease.

How easily water may become polluted, say in a country like India, is shown in a quaint sentence which occurs in Johnson's *Tropical Climates*, and which, though penned in 1813, is as true to-day as when it was written. Speaking of the Ganges supplying drink for the living and a final receptacle for the dead, he says:—

"We may add that the banks of this river present, particularly about the rising and setting of the sun, a motley group of all classes, and sometimes both sexes, sacrificing to the Goddess Cloacina, in colloquial association, not, indeed, offering their gifts in temples, but committing them freely to the passing current."

Yet long before Johnson's day Susrutu, the Hindu physician who flourished about the sixth century B.C., wrote as follows :—

" He falls an easy victim to internal and external diseases, who drinks of, or bathes in, a pool of water which is full of poisonous worms, or is saturated with urine or fæcal matter, or is defiled with germs of vermin or decomposed animal organisms, or is covered over with the growth of aquatic plants, or is strewn over with withered or decomposed leaves, or which in any way is rendered poisonous or contaminated, as well as he who drinks and bathes in a pool or reservoir during the rains."

But water is not the only vehicle of infection. The rôle of uncooked food must be borne in mind. For example, milk may be contaminated from being handled by a cholera "carrier," and imperfectly cooked fish has also been implicated. Indeed, under war conditions, the "carrier" is undoubtedly the most important factor in spreading infection. Danger lurks in salads and raw vegetables, especially in countries like China, where methods of sewage disposal are primitive, and where human excrement is prized as a fertilising agent. The dirty kitchen cloth used for wiping plates and glasses may be a medium of transmission. Flies not infrequently play a part, and there are other rarer modes of spread. Although not a very resistant organism the cholera vibrio nevertheless lives long enough outside the body, especially during the colder months, to obtain many opportunities for finding fresh victims, while it is known that, although the organisms usually disappear in a few days from the dejecta of cholera patients, they may persist in those of a healthy carrier for a couple of months.

Hence it will be readily understood that no one feels altogether easy in mind when cholera is reported.

The cardinal symptoms of the disease may be described as follows : There is a premonitory diarrhœa, rapidly passing on to the repeated evacuations of the typical rice-water stools, which present the appearance of a slightly opaque fluid in which float small white flocculi. These latter are shreds and fragments of the lining membrane of the intestine, which have been shed as a result of the deadly action of the cholera poison. Vomiting sets in, at first of food, later of the same ominous liquid which often suggests dirty dish washings. Pints of fluid pour from the patient, who is drained of his tissue juices and visibly shrinks, his eyes becoming sunken,

his nose pinched, his cheek-bones prominent, his skin cold, clammy and dusky, his pulse feeble and thready. His eyelids, especially the lower lid, assume a white and pearly colour, which makes the eyes appear unduly large and bright, and these eyes are set in an anxious countenance which every now and then is convulsed with pain as the patient writhes in the agonies of cramp. A distressing hiccough may also exhaust the vital powers. The disease may progress speedily to death, so speedily that in the tropics a man may be alive at day-break and buried ere nightfall. All the symptoms become intensified. The skin of the fingers shrivels until they are like those of a washerwoman, the nails may turn black. The eyes recede yet further; a clammy sweat breaks out upon the chill and livid body surface. The voice is husky, there is intense thirst, the kidneys cease to act. The mind is clear throughout but the sufferer lies in a kind of apathy, and if this cold or algid stage continues coma supervenes, and death follows quickly, if fatal collapse from exhaustion has not already closed the scene.

A change may, however, occur, the pulse becoming perceptible at the wrist, the skin gaining warmth, and urine being secreted. The patient may progress to convalescence and recovery. More frequently he passes into a stage of reaction when, though all appears to be going well, as just recounted, a febrile condition manifests itself. This may be severe and be accompanied by various complications, any of which may carry off the sufferer just when he seems out of danger.

The above is a picture of the ordinary severe *Cholera asiatica*, but there are mild cases when the patient, a deadly danger to others, can walk about with perhaps no signs of illness beyond a slight diarrhœa; there are also those tragic instances where the victim is overwhelmed by the poison, and dies before vomiting and diarrhœa have time to make their appearance.

Cholera is *par excellence* a disease of the East. So far as the British Empire is concerned, its chief home is India, and it is also endemic in such British possessions as lie between India and China. It was found by the Portuguese on the west coast of India at the beginning of the sixteenth century, and its history in India has been traced by Sircar in a paper which appeared in the *Calcutta Medical Journal* in 1915. It was known and frequently described as Cholera morbus or Mort de Chien.

The first great *recorded* epidemic occurred in Lord Hastings'

Army, during his campaign against the Pindharis in 1817. Cholera follows trade and pilgrim routes and so may find its way to lands far from its endemic centres. We have seen how it scourged England, and it has visited many parts of the Empire, even the far distant West Indies, but nowadays it has been largely robbed of its terrors both as an invader and a dealer of death.

As soon as its cause was known, as soon as its chief methods of spread had been discovered, man gained the mastery over one of his most dreaded foes.

Even in a country like India, with its teeming millions of ignorant and superstitious natives, and where there is every facility for the dissemination of infection, cholera has notably diminished. This is owing to improved sources of water-supply and "pinking" of village wells, sanitary measures for religious fairs and pilgrimages, the provision of shelter and sanitary arrangements for travellers and pilgrims, the better supervision of burning ghats, and the establishment of guards to prevent bodies from being thrown into rivers. Wherever there is efficient sanitary control cholera need not alarm the community, however disquieting it may be to the individual. This was well exemplified in the Great War, for though the disease occurred in one or two war areas, as, for example, Mesopotamia, it was easily held in check, though unhappily it took toll of some valuable lives.

Yet cholera may still lay claim to the title of an "Imperial Disease" for it is frequently sea-borne, and its presence on shipboard may dislocate trade, while it continues to dog the tracks of punitive expeditions in countries where it is endemic. Along with plague and yellow fever it is the subject of special quarantine regulations, and though it no longer spells disaster, it may still occasion considerable losses both in lives and money.

Its control depends chiefly on the adoption of sanitary measures, including the careful segregation of cases and the disinfection of dangerous discharges such as the stools and the vomit. If pure water cannot be obtained, polluted water may be purified on a large scale as by filtration or chlorination, or both combined. More limited safeguards will be found in the use of potassium permanganate, the so-called "pinking" process, boiling, or even the addition of dilute acids to drinks. If fly-breeding cannot be prevented, adult flies can be trapped and killed, and food protected from their attentions.

The collection and disposal of human dejecta, both liquid

and solid, must be carried out on approved lines adapted to the local circumstances and instituted by persons possessing the requisite knowledge.

Vigilance, constant vigilance, must be the watchword when cholera threatens or is present, vigilance and attention to details—to the hands of the cook, to the icing of drinks, to the milk vessels, to the kitchen cloths, to a dozen items, apparently trifling, but any one of which may be a means of infection, the starting-point of an outbreak.

Acidulated drinks have been shown to be in some degree prophylactic, and quite recently Tomb has strongly insisted on the preventive and curative value of a mixture containing the essential oils of cloves, cajuput and juniper together with spirits of ether and aromatic sulphuric acid. His paper in the *Indian Medical Gazette* for June, 1923, is certainly highly suggestive and the method advocated deserves extensive and careful trial.

At the present time we possess yet another line of defence against this dread malady, which, in its existing form at least, was introduced by Haffkine. This is preventive inoculation by means of a vaccine, best produced by growing cholera bacilli on a suitable solid nutrient medium, washing off the growth with saline solution, killing the organisms by means of some antiseptic, estimating their numbers or weight to standardise the dose, and finally carrying out tests for sterility. The vaccine then consists of a suspension of dead bodies of bacilli with some of the products of their growth in a saline solution to which a little preservative has been added.

The best dose would appear to be 15,000 million organisms given in two inoculations at seven or ten days' interval. The local reaction produced by the subcutaneous injection of the vaccine as now prepared is very slight and there is rarely any general disturbance. The duration of the immunity conferred by inoculation does not seem to be lengthy and it is the custom to repeat the dose after the lapse of four months. It is possible that the oral administration of the vaccine, as advocated by Besredka, may prove the most effective in practice.

War experience has shown the value of inoculation, and it has also been tested with success in village outbreaks in India and elsewhere. The statistics now available leave no room for doubt on this point, and in countries where it is difficult to exercise adequate sanitary control or where sanitation, to all intents and purposes, does not exist, it is a great

comfort to feel that in vaccination of this kind we have a simple, ready and safe means of protecting the community against infection, just as we possess, though we cannot here consider them, new modes of treatment which have robbed the disease of half its terrors. If any one wants to realise what these were like in England not so very long ago, let him read Charles Kingsley's *Two Years Ago*. An abundant literature awaits him if he wishes to understand the horrors of cholera at sea and in tropical countries prior to the days when close observation, logical reasoning and patient research opened a door of hope, a veritable valley of Achor.

CHAPTER III

DYSENTERY

LET it be understood that the term Dysentery, strictly speaking, is not the name of a disease. It signifies a group of symptoms which taken together are characteristic of a condition known in older days as the "Bloody Flux" and which armies in the field had good reason to dread more than any human foe. In dysentery there is a passage of blood and mucus from the bowel, and this highly disagreeable and frequently most dangerous state of things may be occasioned by various pathogenic organisms. For our purpose, however, two only need be considered: the *Entamœba histolytica* and the *Bacillus dysenteriaë*, the former causing amœbic, and the latter bacillary dysentery.

Amœbic dysentery from the imperial standpoint does not possess the importance of the bacillary form, for it does not, so far as is known, occur in epidemics, and hence does not prostrate or sweep away large numbers of people within a short space of time, interfere on a large scale with commercial enterprise, and take toll of the national purse.

For all that, amœbic dysentery cannot be ignored. There is no more insidious disease; there are few disorders which play a greater part in sapping health and energy, and its ill effects are heightened owing to the fact that it is the precursor of that hepatitis, inflammatory and suppurative, which used to be the bugbear of the tropical resident, and which has accounted for thousands of graves in the cemeteries of our overseas possessions.

The dreaded liver abscess ended many useful lives, and many who fared foreign full of hope and enterprise returned, because of it, broken in health and spirit. Happily, thanks to the introduction of emetin and the work of Sir Leonard Rogers, the outlook as regards both amœbic dysentery and hepatic abscess has materially altered.

So far as ætiology and symptoms go the two forms of dysentery may be considered together. They are associated with diet in some way or other, and hence, in this respect, resemble cholera. The infective agent in both is derived from

the intestinal tract of a sufferer or a carrier case. There is also some evidence to show that domestic animals, more especially dogs, may be infected and perhaps transmit this infection to man. In the amœbic form a resistant "cyst" stage of the motile, lowly, jelly-like animal parasite, the entamœba, is concerned; in the bacillary, a vegetable bacterial parasite, a short, non-motile rod of protoplasm of which several distinct species are known to exist, some more deadly than others. In both they reach man, as a rule via the mouth, through the agency of water or food. The water becomes polluted with infected excremental matter; the food becomes contaminated from soiled fingers, from flies carrying the causative organisms either within or without their bodies, possibly from infected dust, and, if in the uncooked form, it may have been rendered dangerous by coming directly into contact with dysenteric material as, for example, in the case of salads and watercress. The organisms lodge in the large intestine, where they set up acute inflammation which, if not promptly controlled, proceeds to diffuse ulceration. The pathological appearances, however, differ according to the nature of the infection.

As regards symptoms there is, as a rule, in both types some premonitory diarrhœa, though this is not always the case. The other features are severe griping pains in the abdomen, frequent calls to the closet, the passage of blood and mucus in the stools, and tenesmus, that is to say, spasm at stool. There is little or no fever in the amœbic form but in the bacillary some febrile disturbance is usually present. Although the experienced clinician may be able to distinguish the nature of the infection, reliance must, in most cases, be placed upon the microscope, and on the results of laboratory investigation. In both forms gangrene of the bowel may eventually supervene, with symptoms of septic absorption, and the condition of the patient, already pitiable, becomes hopeless.

As stated, the amœbic form is frequently followed by hepatic abscess, the entamœba having obtained a lodgment in the liver; much more rarely abscesses may develop in other important organs, as, for example, the brain. Both forms of dysentery may become chronic, and chronic dysentery is a distressing and debilitating disease. Since the war it has filled the hospitals of our Ministry of Pensions, and has ruined the health and prospects of hundreds of unfortunate beings who drag out miserable existences, for all methods of treatment may fail and one has too often to aim at alleviation instead of cure.

Dysentery, at least in its bacillary form, is of world-wide distribution and occurs practically in every part of the British Empire. Bacillary dysentery is not uncommon in the lunatic asylums of this country, and may occur in other institutions, such as jails and schools, if the specific organism is introduced and there has been any divergence from the rules of hygiene. Not only so, but the general population may be attacked through the medium of polluted water-supplies, as occurred not long ago in Wales, when more than 700 people suffered from bacillary dysentery, happily not of a fatal type. In the tropics, and more particularly perhaps in India, it is frequent in native prisons, while, as already indicated, it dogs the track of armies in the field.

Amœbic infection was formerly thought to be confined to the tropics, but it is now known that it can occur also in temperate climates, though it would seem that it is only under certain conditions, of which we are yet ignorant, that its causative protozoon can produce actual illness.

Again excluding the venereal diseases, it may be said that, next to ancylostomiasis and malaria, dysentery constitutes itself a burden upon our welfare and resources. It is impossible to reckon in hard cash the losses it inflicts, but as regards both morbidity and mortality, it militates against efficiency and progress.

It must be combated in the same way as cholera and has, in many lands, been successfully fought along similar lines. It is now rare in countries where there is efficient sanitary control, and when it occurs in such places it can be easily checked, for we know how it is caused and how infection is conveyed.

Largely because it is not as terrifying a visitant as cholera, it is not so easily dealt with amongst native populations, and moreover, it is more widespread, persistent, and all-pervading.

As amœbic dysentery is due to a protozoon no preventive vaccine has yet been devised for it, while, though vaccines of various kinds have been introduced for the bacillary form, none has so far proved very efficacious, partly because it has not been possible to produce a preparation which when injected does not cause a severe local reaction. At the same time there is hope in this direction, for methods are being adopted to lessen this toxicity, and the oral administration, as recommended by Besredka, is calculated to obviate this drawback.

At present, however, we must rely upon general sanitary measures, combined with that education which is the basis of all endeavours to safeguard the public health.

CHAPTER IV

ENTERIC FEVER

ALTHOUGH the term "Enteric Fever" has been used as the heading of this section, it is intended to include not only enteric or typhoid fever, but also those allied, though distinct, paratyphoid fevers which bacteriological research differentiated not so long ago from true typhoid fever.

All these diseases are sometimes classed under the name "Enterica," but this is a term to which many, with good reason, object. The paratyphoid fevers, distinguished as A, B, and C (there may possibly also be a paratyphoid D), played no insignificant part in the Great War, especially in the Mediterranean area, but from the hygienic standpoint they may be regarded as merely mild forms of enteric fever. Enteric fever is a bacterial disease caused by the *Bacillus typhosus* of Eberth, a short rod furnished with flagella, to which it owes its marked motility. Organisms very similar in appearance but differing in their cultural and serological reactions are responsible for the paratyphoid infections. The bacillus finds a nidus in the small intestine, where in true typhoid, and sometimes also in the paratyphoid fevers, it produces an ulceration of the lining membrane of the bowel, such ulceration as a rule being limited to certain circumscribed patches. In addition, the bacillus is found in other parts of the body, notably the spleen, while it must not be forgotten that acute typhoid is what is called a septicæmic disease, that is to say the causative organism circulates in the blood, from which indeed it can be isolated. Not infrequently it takes up a lodgment in the gall-bladder, which may then become a reservoir, and in the case of chronic carriers serves as a source of supply of bacilli voided in the fæces.

Enteric fever is undoubtedly one of the great Imperial Diseases, but for many years after it had been definitely recognised and duly classified it was looked upon as a malady the stress of which fell chiefly on the white man. The native races in the tropics were supposed to be more or less immune. Some believed they were naturally immune, others considered that they suffered mildly from the complaint in childhood,

and so escaped in later life, yet others that from infancy onwards they received small doses of the causative bacilli, and hence were not liable to attack as adults, in other words, that they were vaccinated when young by a method something like that which Besredka now employs.

There is doubtless some measure of truth in the two latter theories, but better methods of diagnosis have shown that natives do frequently suffer from typhoid fever, though to a smaller extent in Africa than in India. This, however, may possibly be explained by the conditions of life in India, which afford greater facilities for infection.

Ever since the work of Stewart and Jenner in Great Britain, following observations made in France and the United States, separated typhoid from typhus, the important part played by the former as a menace to health has been recognised. This menace has, however, steadily diminished as progress in hygiene has advanced, and amongst civilised communities in temperate climates the enteric group of fevers no longer bulks as it used to do.

The situation also as regards the army on active service has greatly changed, owing to the perfecting of the method of anti-typhoid inoculation to which reference has already been made. In the tropics, however, the enteric fevers are still a source of trouble and anxiety, and there can be no doubt whatever, that in certain places they are much more prevalent than is usually supposed. This is undoubtedly true of Mauritius, and is probably also the case in some other countries. Where malaria is rife, and more especially the type characterised by a remittent fever, typhoid cases are very apt to be mistaken for it. Without the microscope the diagnosis is by no means easy, especially where the coloured races are concerned. On the dark skin the characteristic spots of the typhoid rash are not easily detected, while in any case, they are not by any means always present in what may be called tropical typhoid.

Just as cholera and dysentery are "dirt" diseases, so must the enteric group of fevers be associated with filth. The method of infection, that is, the means whereby the specific organism reaches its victims, may be described briefly and alliteratively as follows:—

Careless contacts and convalescents, carrier cases, chiefly cooks, defective drains, dirty dairies and drinking-water, faultily fried fish, sewage-soaked shell-fish, the dust of dried dejecta, and the repulsive regurgitations, dangerous droppings and filthy feet of faecal-feeding flies fouling food.

If carefully considered in detail it will be found that this sentence covers in one shape or another all known avenues of infection.

As regards distribution it is probable that the enteric fevers occur in all parts of the British Empire. There are, no doubt, isolated regions where they are unknown, and there are certainly places where they are said not to occur, but if a properly conducted inquiry were instituted their presence would in all probability be revealed.

The symptoms of typical typhoid are at first indefinite. The patient is seedy, he has a headache, and perhaps pains in his back and legs. His abdomen is uneasy, he may feel feverish and shivery, and be troubled by either diarrhoea or constipation. His cheeks are flushed and his eyes are bright.

Gradually the disease fastens upon him. He becomes heavy and listless. His fever increases, the evening rise being prominent, and he has to take to his bed. His tongue by this time is probably dirty and his breath offensive and, if his surroundings are not strictly hygienic, he may emit an odour which to the trained clinician is distinctly suggestive. There is not, as a rule, much pain associated with the complaint, but there is often discomfort and restlessness. The fever, rising at night and falling somewhat in the morning, continues to mount until it attains a maximum. Then in ordinary uncomplicated cases, it falls by what is called lysis, that is to say, gradually, the complete picture upon a chart resembling two flights of stairs, one ascending, one descending, and meeting on an undulating plateau. Characteristic rose-pink spots appear upon the abdomen, which is usually somewhat tumid and may show a certain fullness in the region of the enlarged and engorged spleen. At the height of his illness the patient is stuporose and in bad cases has often delirium, usually of the low, muttering type. The bowels vary. In the majority of cases there is the loose pea-soup stool associated with a definite diarrhoea, but constipation is far from uncommon and much depends on how the patient is fed. In severe types of the disease sordes accumulate about the teeth and gums, the lips are harsh and cracked, the tongue is dry and heavily furred, the cheeks are unhealthily flushed, the eyes half closed, and there may be tremblings and twitchings, all evidence of the intensity of the intoxication, of the power of the typhoid poison. As the ulceration proceeds it may lead to hæmorrhage from the bowel, or perforation of the wall of

the intestine may occur, with the escape of the gut contents into the peritoneal cavity and resulting peritonitis.

In cases which recover the patient, often emaciated and—if, *secundum artem*, he has been starved during treatment—ravenously hungry, passes into a stage of somewhat prolonged convalescence, slowly regaining strength and liable to relapses, especially if there be any indiscretion in diet. It may be noted that in hot countries the attack tends to be more severe and prolonged than is the case in temperate climates. Hence the mortality is apt to be higher in the tropics, where cases showing hyperpyrexia are more frequent and where the heart muscle is often affected.

As for the paratyphoid fevers they tend to resemble true typhoid in miniature, but have certain characteristics of their own, which, however, cannot be here considered.

Like dysentery, the enteric fevers are a constant drag upon the wheels of the sanitary chariot, but they exercise their chief influence in time of war and stress. So far as war is concerned this has been considered, necessarily in a cursory manner, when treating of the Army, but it is well to bear in mind the part these diseases play in undertakings like railway construction, especially in wild and tropical countries where sanitation has perforce to be rudimentary. Although rudimentary it need not necessarily be imperfect. Experiences in the field have shown how readily improvisations can be adopted which, however rough and ready, are yet of a nature to prevent danger from infected excremental matter. In the old days native workmen, and indeed members of the European staff, "went to bush," too often, with the disastrous result of leaving their bones in the wilderness. Now we know better than to adopt such primitive customs, though unfortunately our knowledge is not always utilised. In any undertaking which necessitates an agglomeration of human beings for purposes of labour, religious observance, amusement, and so forth, it is essential that there be sanitary control and that the persons charged with such control be those first on the ground. Time and again in the war this principle was not acted upon and the dereliction brought its own punishment. In war, however, man is frequently not complete master of the situation. Expediency in war is a very different thing from expediency in civil life. There are few civil enterprises which demand such urgency in their execution as to furnish a valid excuse for neglecting the claims of hygiene. Even at the heart of the Empire care is necessary and improvement is required.

The conditions still obtaining in many rural parts of the British Isles are far from satisfactory, especially as regards the arrangements for night-soil. Hence it is not surprising that enteric fever lingers in the land—and every now and then reminds the community of its presence in no uncertain fashion.

A consideration of the methods of conveyance of the virus will indicate, broadly speaking, the measures which must be put in force; they are similar to those employed against cholera and dysentery. Easy of adoption in countries blessed with an efficient and well-organised sanitary "police," and furnished with all the requirements which modern hygiene demands, they are in many parts of the Empire beyond the dreams of the optimist.

Hence there is a tendency, a growing tendency, to have recourse to that preventive inoculation which has proved its value in time of war. That it is an excellent prophylactic measure no one who has studied the subject with an unbiased mind will deny. That it is a valuable auxiliary in the campaign against the enteric fevers, more especially in times of emergency, will be generally admitted, but it appears to us that it would be a pity were it to usurp first place in the line of defence. There is a distinct danger that this may occur, and that thereby communities will be led to neglect their obvious duties in the way of providing cleanly surroundings and carrying out essential sanitary works. It is no doubt cheaper to pay bi-annually for two preventive doses of vaccine, than to be mulcted heavily in the rates for a new and satisfactory water-supply. It is cheaper but not wiser in the long run. Enteric fever is only one of several filth diseases, and if a community is to live healthily and happily, it must pay handsomely for those services which abolish filth and the ill results of filth. It is not a sound sanitary policy to rely on a large scale upon a measure like preventive inoculation, if only because the enteric fevers cannot, so far as ætiology is concerned, be divorced from other dangerous maladies against which an anti-typhoid vaccine conveys no protection, and because progress in sanitation is one of the most important factors in education and the physical, mental and moral improvement of mankind.

How valuable inoculation may be under special conditions in civil life is well exemplified in a report by Dr. L. S. Mackid on its use in the case of the employees of the Canadian Pacific Railway at Alberta. It was published in the *Lancet*

for June 12th, 1915, and though it cannot be considered in detail the following figures may be given :—

Total number of men employed	.. ..	24,000
" " " vaccinated	.. ..	13,900
Number of cases among non-vaccinated	.. ..	290
" " " vaccinated	.. ..	3

Where recourse is had to inoculation the triple or T.A.B. vaccine is to be preferred, as it protects against typhoid, and the two chief paratyphoids. It is important to note that the inoculated person is not only much less liable to contract infection but, if his defence is pierced, his illness is likely to be much milder and his chances of recovery are greatly enhanced.

The official army vaccine, which has a fine record to its credit, contains 1000 million typhoid bacilli, 750 million paratyphoid A, and 750 million paratyphoid B, in each cubic centimetre of the liquid medium in which the dead bacilli are suspended. For adults two doses of 0.5 c.c. and 1 c.c. respectively are given at an interval of ten days and are as efficacious in the case of the coloured as of the white races. The local and general effects of the reaction are not severe, and the immunity conferred lasts from eighteen months to two years. It is not customary to vaccinate very young white children, for they are usually to some extent protected from infection, and if they do contract typhoid fever, they are not likely to suffer severely.

There is one condition against which our preventive measures are still comparatively powerless, and that is the "carrier" state. Once the bacilli find a nidus in the gall-bladder it is very difficult to get rid of them and the chronic carrier, at least if he or she be careless and engaged in the handling or preparation of food, is a great source of danger, anxiety, and expense, for isolation is the only radical way of dealing with the problem. Generally speaking, however, the danger from carriers appears to have been exaggerated. Numerous attempts have been made to cure the chronic carrier, and resort has even been had to operations upon the gall-bladder, but so far no entirely satisfactory remedy has been evolved. Until this has been found the situation must be regarded as disquieting, even though it may be truthfully said that the enteric group of fevers, like other disease foes of the human race, has been met and mastered.

What this means from a financial point of view—the only consideration which appeals to some misguided people—is apparent from the subjoined extract from the Annual Report of the Rockefeller Foundation for 1919. Incidentally it is worth noting that for the most part we have to tap American sources for information of this kind. We are only beginning to realise the value of such evidence in health propaganda. The extract is as follows :—

“ In the town of Salisbury, North Carolina, where in 1918 a sanitary latrine was built at every home not connected with a sewer, there were only two cases of typhoid fever during 1919, as against forty-three cases during the preceding year. In the entire State of North Carolina during 1914, the first year in which deaths from all causes were recorded, there were 839 deaths from typhoid fever. Since that year there has been steady progress in rural sanitary work throughout the State, and a correspondingly steady decrease in the incidence of typhoid fever. In 1919, there were only 427 deaths from this disease, or 412 fewer deaths than in 1914. Each death from typhoid means at least ten cases. A decrease of 412 in the number of deaths means, therefore, the prevention of 4120 cases of the disease. Rosenau places the average cost of a case of typhoid fever at \$400. On this basis the prevention of 4120 cases of typhoid may be estimated as having saved the State about \$1,648,000 a year.”

Take the British Empire as a whole in lieu of North Carolina, and think what the successful prevention of filth diseases signifies to the coffers of the Commonwealth !

CHAPTER V

INFLUENZA

IN all probability influenza would have been omitted from this list had it not been for the terrible pandemic which scourged the world during the years 1918 and 1919, and slew far more people than perished during the whole course of the Great War. There has been a tendency to think of the disease as more or less confined to cold or temperate climates, to look upon it as the concomitant of the catarrhal conditions so prevalent in countries with bleak winters and trying springs, to forget that influenza is a specific disorder of a highly contagious nature which may find a footing anywhere, and which, in certain forms and at certain times, is exceedingly deadly to the coloured and black races of mankind.

Influenza is not an "Imperial Disease" in the same sense as those we have hitherto considered. It is true that it possibly lurks in a mild and perhaps unrecognised form in those countries where it is supposed to be endemic. In this connection we cannot do better than quote certain remarks of Jordan, who contributed a valuable paper to *The American Journal of Hygiene* for July, 1922. He says:—

"There is no escape from the conclusion that the so-called influenza of inter-epidemic years is in whole or in part different from the influenza of the great epidemics of 1918 and 1889. A great many of the deaths recorded under the name influenza in the years between epidemics are certainly not due to the same microbic causes as those occurring in epidemic years. Is this true of all? Eliminating the deaths attributed to inter-epidemic influenza on grounds of clinical similarity, local and temporary fashions in medical nomenclature and other unessential reasons, is there still in Europe and North America a residue of cases and deaths from true influenza which keeps a thread of continuity between the great outbreaks? This question is not now possible to answer, and perhaps no answer will be possible until the causal agent can be surely and readily identified."

It will be seen therefore that influenza cannot be said to be constantly sapping the health and vigour of the community, and it does not, as a rule, interfere with commerce.

Neither is it much in evidence in tropical and subtropical lands under ordinary circumstances. And yet, as recent events have shown, and as a study of its history clearly indicates, there is no malady which better merits the title "imperial" than influenza in one of its great periodical outbreaks. It then sweeps like a pestilence from country to country, sparing no race, indifferent to climate, dislocating traffic, occasioning immense losses in lives and money, and teaching anew the lesson that we are in large measure powerless against those communicable diseases whose true nature is still obscure, even if, as in the case of influenza, we have some idea as to the methods of spread and know in a general way how best to combat them.

As Sir George Newman ably puts it in his Introduction to the Ministry of Health Report (1920) on the Pandemic of Influenza :—

"The fundamental requirement to make us masters of our fate is a universal improvement in the standard of health and the conditions of life. No technical device, no narrow or specific remedy for pestilence, can ultimately triumph apart from a sanitary environment of the community and the sound nutrition of the individual. They are the bed-rock. Out of them spring the sources of national vitality. Hardly less certain is it that we require, and must seek till we find, more knowledge. We have in substantial degree the means of controlling tuberculosis and syphilis, malaria and plague; we fail to control these four pestilences largely because we do not use the means; and education is perhaps the answer to that. But in the case of influenza and its allies we are not yet in possession of the means, and whilst we press forward with the improvement of sanitation, of nutrition and of the conditions of life, we must apply ourselves anew to search and research into the causes of primary and secondary infections, into epidemic catarrh and the common cold, into carriers, and into immunity. That is perhaps the principal lesson which is taught us by our experience of the great pandemic."

It will be seen that in 1921 nothing was definitely known as to the exciting cause of the disease. The same is still true despite certain non-professional claims which have been made as the result of prolonged and careful work in the United States.

Here it may merely be stated that many believe that a small bacillus, originally isolated and described by Pfeiffer, is to blame, while many others are of opinion that the infection

is due to what are called filter-passing organisms, tiny forms so small that they can scarcely be seen by the highest powers of the microscope, and which are capable of traversing the walls of the fine-grained filters used in bacteriological work. These are the two main theories which hold the field at present. There are others of less importance, some of them mere variants of these two beliefs, but, like them, demanding further inquiry.

As to methods of transmission of the virus, whatever it may be, we stand on surer ground. There can be little doubt that there is a direct transmission from the sick to the sound, and that in most cases infection is by way of the respiratory passages. We also know that there are certain predisposing causes. Misery is one of these, whether due to depressed mentality or the result of poverty and under-feeding. The close association of people, as occurs in cities, is also operative, though the influence of actual overcrowding would appear to be more marked on the fatality of the disease than on its incidence. Mere weather conditions, however much they may be operative in limited outbreaks, cannot be said to have played much part in the great pandemic, though naturally any factor depressing vitality, such as cold and damp, cannot be altogether ignored.

The common symptoms of influenza are so well known that they need not be described in detail. It should, however, be noted that there are four chief types: the respiratory, gastric, nervous, and febrile. It was the respiratory form which was chiefly in evidence throughout the Empire, but in some respects it did not conform to the usual conception of a malady commencing with a severe coryza and nasopharyngeal catarrh. It was much more common to find a sudden onset heralded by shivering, severe headache, pains in the back and limbs, and a feeling of prostration. Occasionally there was giddiness and collapse. A dry and sore throat and a hacking cough were much in evidence. Other symptoms noted were fever, sometimes to a considerable degree, a flushed face, injected eyes, a heavily furred tongue, and a drowsy state with a dislike for bright light. Later, the windpipe and the bronchial tubes showed signs of involvement, while pleurisy was a frequent concomitant, but it may be said that the symptoms varied in different individuals, and that the stress of the disease fell on any weak spot. In uncomplicated cases improvement set in about the third day, and the patient soon got well. In many instances, however,

the malady assumed a toxæmic form, that is to say the influenza poison fastened on the patient. In very severe cases the heart failed rapidly. In others, the lungs were attacked and a broncho-pneumonia or a lobar pneumonia placed the victim's life in imminent danger. In such cases a curious cyanosis sometimes developed, the patient's face assuming a "heliotropic" hue. This cyanosis, a dreaded sign, has been shown to be caused by an exudation into the air-spaces and interstitial tissues of the lungs. Various complications were noted, but these need not be described, though there is evidence to show that much of the fatality was due to secondary bacterial invaders. Whatever the cause, there was a pronounced tendency to a swamping of the patient's defences by a most virulent poison, an attack so sudden and severe that in many cases remedial measures were given no time to exercise their effects.

It is worthy of note that the febrile form, especially when it exhibited an intermittent temperature, was frequently mistaken for malaria. Sometimes the pyrexia was the only visible manifestation of the disease and then, unless recourse was had to a blood examination, the diagnosis was very apt to be faulty in this respect.

Wherever the so-called "Spanish" influenza arose, it soon commenced its travels, and owing to the fact that the war had upset the usual routes and interfered with customary habits of life, its epidemiology became somewhat specialised. Moreover, it found many of the prevailing conditions favourable to its diffusion, and also well calculated to increase its virulence. Thus, upon crowded transports it ran riot, and wherever troops were congregated in barracks and in huts, or sailors in ships, it made its presence felt. In many of our overseas possessions the outbreak caught our Health Authorities napping. Though one might have thought the warning was sufficiently insistent, there was no general recognition of the fact that we had here to do with a menace beside which that of small-pox, cholera, plague, or yellow fever was comparatively trifling. Hence quarantine precautions were not taken, and as a result thousands were doomed to death. In justice, however, it must be said that there were excuses for such negligence. For one thing, the whole world was, as it were, gasping for breath after the terrific convulsion through which it had passed, and there had been no time for normal adjustments; for another, the close of the war urgently demanded the return of troops

to the territories from which they had come ; for another, the nature of the disease with its short incubation period and its ill-defined symptoms made preventive measures difficult ; for yet another, few, if any, realised the havoc which influenza of this type could play in countries where the climatic conditions were so very different from those with which inter-epidemic influenza is usually associated.

Knowledge of the history of the disease might have saved the situation, but, as so often happens, the door was shut after the steed had been stolen ; in other words, regulations were put into effect only when the invader had gained a footing and was slaying right and left.

This is well exemplified in the case of the Union of South Africa. It is highly instructive to study Chapter V. of the Report of the Influenza Epidemic Commission which was appointed in that country, and which will be found in the *Medical Journal of South Africa* for February, 1919. The situation in South Africa was in no sense exceptional and is cited merely as one proof of the above statement.

As to the results, wellnigh the whole Empire was affected. We were so surfeited with horrors, so inured to death and suffering, that the true magnitude of the disaster was never appreciated. Possibly it was most apparent overseas, and hence failed to impress itself upon the public mind in England and Wales, where, however, the people were in great concern over a disease which in fifty-nine weeks, *i.e.* from June 23rd, 1918, to August 10th, 1919, swept away 151,446 from their midst, and these in many instances young and previously healthy adults.

To the general reader statistics offer dry reading and often convey very little. Hence it will suffice to mention two of our overseas possessions, a large one and a small one, in this connection.

India will not readily forget the great pandemic, which attacked it in three successive waves and which formed the subject of a Report to the *Office International d'Hygiène* by Major H. H. King, I.M.S. During 1918 the Sanitary Commissioner estimated that 7,089,694 persons died of influenza throughout the whole of British India out of a total population of 238,000,000. For 1919, during which year the disease was less in evidence, no complete figure is given, but it would seem that 200,000 people died of influenza in Bengal, and perhaps twice that number in the United Provinces. It is true that none of these estimates can be considered more

than approximately correct, but they do give some idea of the severity of the infection.

Turn to Mauritius, a tiny island in the Indian Ocean, which might possibly have been safeguarded from invasion. In 1919 more than 11,000 persons perished out of a population of about 375,000. Terrible scenes were witnessed, and the island was so sorely stricken that even two years afterwards it had not recovered from the effects of the pestilence.

It was the same everywhere. Here is what a government official wrote in a private communication to one of us concerning a remote part of Central Africa: "I found whole villages of 300 to 400 families completely wiped out, the houses having fallen in on the unburied dead and the jungle having crept in within two months, obliterating whole settlements."

Turning now to methods of control, we find that these are hampered owing to our ignorance of the cause. In preparing a vaccine to combat the disease there is no certainty that it has been possible to include the organism which is really at fault. Hence recourse has been had to what are sometimes termed "shot-gun" preparations. In other words, vaccines are used containing a variety of organisms which have been found in the bodies of patients, and some of which at least play some part in producing the symptoms of the disorder.

These vaccines differ in composition in different parts of the world. To take one example only. Certain bacterial organisms, which under the microscope look like short chains of beads, and are called Streptococci, are very generally found in the sputa of influenza cases and in the bodies of those who have died of the disease in temperate climates. Some of them are possessed of great virulence and are indeed amongst the most important of those secondary invaders to which passing reference has been made. Hence in England and elsewhere influenza vaccines nearly always contain streptococci. In tropical Africa, on the other hand, streptococci are very rarely in evidence, and therefore they are omitted from vaccines intended for use in this part of the world. The evidence as to the value of prophylactics is conflicting. When given in sufficiently large doses they sometimes appear to have done good, but our knowledge on this point is still not accurate enough to warrant any definite statement.

We are on surer ground as regards general measures. Cases must be isolated. Free ventilation should be enforced

wherever possible. As regards overcrowding, the compilers of the Report by the Ministry of Health, who are considering influenza in this country, remark that—

“From what has been said in the report, it follows that to avoid crowds, to shield the mouth and nose when coughing or sneezing, not wantonly to thrust one's face into the face of one's interlocutor, are essentially rational and appropriate methods of reducing the risk to take influenza. It even appears probable that the one form of overcrowding which in some little measure *can* be controlled by the individual, is the form most potent to spread the disease. In the present state of the nation to advise the avoidance of overcrowded tenements and lodgings is indeed a counsel of perfection; it is likewise a vain quest to seek for public conveyances not grossly overcrowded; but it is quite easy not to frequent theatres, music halls, and picture houses; it is even possible to avoid bargain sales, political meetings, and assemblies. These forms of congestion belong to the extra-domestic group which by a process of exclusion, we have discovered to be more influential than intra-domestic conditions admittedly hard to control now.”

Patients should, as far as possible, be treated in the open air, so that there will be less risk of their conveying infection to the healthy. Thus on shipboard cases should be got up on deck and kept there if at all feasible. Nurses and attendants should be protected by face masks against droplet infection from the mouths and noses of the sick. There are various methods of disinfecting the naso-pharynx by means of sprays or inhalations. Antiseptic throat gargles may with advantage be employed, while chill and over-exertion should be avoided. Good and nourishing food will aid in keeping the invader at bay, and, as in the case of most communicable diseases, moderation in all things is to be commended.

Such precepts are easily preached anywhere and perhaps a majority will practise them, when influenza threatens, in countries where the conditions resemble those in England, but amongst native populations the difficulties are well-nigh insurmountable. In future we should be on our guard and every effort should be made to prevent the introduction of sea-borne influenza. That this is a task worth attempting is shown by what happened in Australia, where it is claimed that escape from the devastating forms of the disease—an escape in marked contrast to what happened in, say, Sierra

Leone, South Africa, and New Zealand—was due to the result of the work of the Commonwealth Quarantine Service (possibly the most advanced and efficient in the world), and was attained by the holding in quarantine of every infected vessel during the six months of danger.

Lack of space unfortunately prevents any further reference to this matter, but those interested should study Dr. J. H. L. Cumpston's *Influenza and Maritime Quarantine in Australia* (1919), or the review of it which appeared in the *Medical Journal of Australia* (August and September, 1920), and which also deals with inter-state quarantine. Attention may also be directed to a consideration of Dr. Cumpston's claims in an article in the *British Medical Journal* of November 29th, 1919, which admits that the maritime quarantine measures adopted were successful for at least the first three months during which they were in operation. Hence there is good reason to consider their applicability in the future.

Meanwhile general education in Sanitary Science must be pushed forward, for, in the case of epidemic influenza, perhaps more than in that of any other disease, the hygienist's attempts are of little avail unless the public seconds his efforts in an intelligent and sympathetic way. In this connection mention may be made of the kinematograph film entitled "Dr. Wise on Influenza," which was prepared under the auspices of the Local Government Board in 1918. This graphic representation, or others like it, can, and should, be used widely both at home and abroad. Their exhibition should indeed form part of a definite educational programme on what may be called the Religion of Hygiene, to be adopted throughout non-epidemic periods. It is, however, devoutly to be hoped that before the next great pandemic makes its appearance, perhaps a generation hence, the cause of influenza will be definitely known, and it will be possible to employ for the non-immunes a preventive vaccine of such potency that the disease will be found to have lost at least half its terrors.

CHAPTER VI

MALARIA

NEXT to tuberculosis, malaria is the greatest disease-enemy of man, and disputes with that disease and with ancylostomiasis for first place amongst the "Imperial" maladies. There is, indeed, evidence to indicate that in the past it has been a destroyer, if not of empires, at least of nations, for, as shown by Jones, whose views receive the support of Sir Ronald Ross—at whose instigation indeed he promulgated them—there is reason to believe that ancient Greece was devastated by this disease, which also exercised a baneful influence on the Italy and Spain of early days. In our own period its destructive effect upon a whole people is best exemplified by what occurred in Mauritius, a colony which has suffered grievously since the introduction of the malady in epidemic form, a visitation which wellnigh ruined it irretrievably.

The most characteristic thing about malaria, at least in its typical form, is that it presents a series of paroxysms of fever separated by fever-free periods. Each paroxysm comes on at regular intervals, and each consists of what is called a hot and a cold stage. As we shall see, these symptoms depend on what happens to its causative organism, which is found in the human blood. As proved by Laveran, malaria is due to a primitive parasite which belongs to the lowest division of the animal kingdom. It is a protozoon, commonly called a plasmodium, and possibly a descendant of certain intestinal parasites called Coccidia, which inhabit the cells of the wall of the gut. If this is so, then the malaria parasite changed its habit of life and found a more congenial habitat in the red blood corpuscles. At any rate that is where it is now found developing and where it works the mischief which is mainly responsible for the symptoms of the disease.

It has a life-cycle which reads like a romance and which for its accomplishment necessitates the presence of two other animals—man and the mosquito. It may be asked which of these came first, but perhaps the answer had better be supplied by some spiritual adviser, for it is as difficult to furnish as that concerning the hen and the egg.

Apes, monkeys, buffaloes, goats, antelopes, civet cats, jumping rats, bats, flying foxes, and squirrels amongst the mammals have been found to harbour malarial parasites, but these conform to special types and are distinct from the human species. It is interesting, however, to note that the plasmodia of the apes, such as the chimpanzee and the gorilla, approximate most closely to those of man. Birds get malaria, and so do certain cold-blooded animals, but their parasites are also different from the human organism. Still those of birds sufficiently resemble those of man in nature and life-history to make them useful objects of comparative study. It was research upon them in the first instance which enabled Ross to solve the problem of the transmission of malaria, the greatest discovery ever made in the realms of tropical medicine.

Ross's work in India, followed by that of Grassi, Bignami, and Bastianelli, conclusively proved that the disease is transmitted to man by mosquitoes of the group *Anopheles*. Curiously enough this name is derived from a Greek word signifying "harmful," and was conferred upon these mosquitoes long before their rôle as malaria carriers had been elucidated.

This transmission by mosquitoes is the only known method whereby man acquires malaria. The parasite of the disease is limited to man and the *anopheles* mosquito. The mosquito obtains the parasite from the blood of man and returns it in an altered form to the blood of man. Other species of mosquito and other insects may and do suck the blood of man containing malarial parasites, but in all such cases the parasite perishes. There is only the one link of survival, a fortunate thing when preventive measures are under consideration.

When, as seems probable, the ancestors of the malaria parasite inhabited the intestine, it was easy for them to escape from the body by way of the dejecta, but such an opportunity was not forthcoming for the plasmodia when they had become lodged in the blood. In this medium they multiply and produce resistant forms which are incapable of further development in the human body, and therefore the female mosquito comes into the picture and along with the blood of her victims sucks up these forms, which are adapted for life and multiplication in the body of the insect. As a result the mosquito is eventually found to harbour in her salivary glands tiny sickle-shaped bodies called sporozoites. When the mosquito bites with a view to obtaining

a blood feed she injects some of her saliva into the blood, and with this saliva there enter numbers of these little sporozoites. Let us trace briefly what happens to any one of them which has been fortunate enough to escape the attention of one of the blood-policemen, as the leucocytes or white cells, part of man's defensive mechanism, may be called. The sporozoite attaches itself to a red blood corpuscle which—for the point is still doubtful—it is believed to enter and which in any case it proceeds to destroy. It does so by growing at the expense of the red cell, on whose hæmoglobin or colouring matter it feeds and from which it manufactures a peculiar black pigment which is constantly associated with malaria and which gives the growing and devouring parasite a very characteristic appearance. The little invader rapidly increases in size and eventually breaks up into a number of divisions, which are known as merozoites (parts of an animal). Their number varies with the species of malaria parasite concerned, for, as we shall see, there are three species, just as there are three types of malarial fever. When these merozoites have formed and present an appearance like a rosette, in other words when the parasite is "ripe," the containing envelope of the red cell gives way and they are shed into the blood stream. Some are caught and engulfed by the white cells of the blood, but a number succeed in getting into other red blood corpuscles, and each starts again the destructive process just described.

Considering that there are some millions of them in the blood during any severe attack, is it any wonder that a malarial patient becomes pale and anæmic? Not only so, but the parasite produces a toxin or poison which, when the red cells burst, is liberated into the circulation along with the merozoites, and may do a great deal of harm in the way of causing fever and acting deleteriously on certain of the internal organs, especially the spleen.

It must be noted that in the stages of the life-cycle we have just traced, the question of the sex of the malarial parasite does not come into consideration. There is, as we have seen, a development, but it is not due to any sexual act on the part of the small, jelly-like, pigmented animal parasite. Hence this is known as the non-sexual cycle. Now if there were only this cycle the parasite would fare badly, for either it would slay its human host and perish with him, or its human host would, by means of the blood-policemen

and other agencies, overcome the organism, whose life in either event would come to an end.

In order, therefore, to continue its nefarious career, it must reach another host, and, as already indicated, it does so by producing certain resistant forms adapted for life and growth in the interior of a female anopheline mosquito.

These resistant forms are the products of the ordinary non-sexual stage, and they are endowed with male and female properties. Some of the intra-corpuseular parasites, instead of dividing up and bursting, become sexually differentiated. They change either into spherical or crescentic forms, two of the three species of malaria parasite producing the former, and one the latter. Of these, whether they be spherical or crescentic, there are males and females, which can be readily distinguished by an expert microscopist.

Now, when a mosquito has a blood feed she takes up along with the normal blood elements the non-sexual intra-corpuseular forms and also these sexual resistant forms which, though they can scarcely any longer be called intra-corpuseular, are shrouded by the remnants of the red cells, *i.e.* their thin and often distended enveloping membranes. In the mosquito's stomach the non-sexual forms perish, but the sexual forms undergo a wonderful transformation. After some preliminary changes the male cell extrudes filaments, which are thrown off, and these filaments are the male elements which seek and enter the female cell. The product of this union is a body shaped at first something like an elongated egg, then, as it starts on its travels, becoming more like a short worm. It creeps through the wall of the mosquito's stomach and comes to rest on its outer surface underneath the thin outer layer of that organ. There it grows, assuming a cyst-like appearance, so that eventually, there being a number present, the stomach becomes studded all over with them.

The contents of each of these little bags divide and subdivide, and eventually enormous numbers of sickle-shaped sporozoites are produced. These are at last set free and journey to the salivary glands of the mosquito, whence, as we have seen, they reach the blood of her human victims. The whole of this intricate process takes about twelve days to accomplish ; in other words, within a fortnight the *infected* mosquito becomes *infective*.

We have seen what happens when the sporozoites gain the blood, and it is now necessary very briefly to explain why

three species of parasite are recognised and how they are associated with the three types of malaria.

The parasites are differentiated because: (1) In the human blood they take different times to pass through their cycle of development, that is, from the time of entry into the red cell until the time when this bursts and the merozoites are shed; (2) They differ in size, motility, and other particulars; (3) They produce somewhat different effects on the red cells they parasitise; (4) They vary as to the number of merozoites into which they split; (5) The sexual cells which they form are not all of the same type.

There is no need to explain the matter at greater length save as regards the first of these reasons, so we will merely state that the three species are named *Plasmodium malariae*, *Plasmodium vivax*, and *Plasmodium falciparum* (because it produces crescent-shaped cells), and that they are responsible for the quartan, benign tertian, and malignant or subtertian (often called tropical) types of fever. How did these latter names arise? In quartan infections *Plasmodium malariae* takes seventy-two hours to complete its cycle in the red cells. In benign tertian infections *Plasmodium vivax* takes forty-eight hours, and so does *Plasmodium falciparum* in subtertian infections. It will be remembered that mention was made of the paroxysms of fever and of their hot and cold stages.

We can now see that the stages in the life-cycles of the parasites correspond to stages in the clinical picture of the malarial attacks. The cold stage, or chill, in which, despite its name, the temperature is rising, corresponds to the moment when a red cell bursts and discharges the merozoites, which begin to enter fresh red corpuscles; the hot stage, with a temperature away up at 104° or so, is when the parasite is young and beginning to grow in the red cell; and the fever-free period occurs when the parasite is undergoing its development in the corpuscle, and lasts until the next burst takes place. Now as the *quartan* cycle occupies seventy-two hours, the second attack of fever will occur on the *fourth* day of the disease (hence the name quartan), while in a simple *tertian* infection, taking forty-eight hours for its cycle, the second attack may be expected on the *third* day (hence the name tertian). The same should be, and sometimes is, true of a malignant or subtertian infection, but too often its pyrexia is quite irregular, frequently remaining high all the time. Malaria is one of the most protean of diseases, and its symptoms

vary a great deal. Hence we must be content to describe those of a typical ague attack. About ten or twelve days after the infected and infective mosquito has discharged the malarial sporozoites into its victim's blood, so great an increase has taken place in the number of the parasites that they are capable of producing symptoms.

Hence the patient, for so we may now term him, feels upset, is tired, has an aching in his bones, perhaps a headache, loses his appetite, possibly vomits, and suffers from chilly sensations. His temperature may have begun to rise, and later the true fever bout fastens upon him. Premonitory signs may, however, be quite absent, and the patient may suddenly find himself in the grip of ague, shaken by a definite rigor and with such an intense feeling of cold that his teeth chatter like castanets and he shivers and shakes. Very often he may begin to vomit violently. He creeps into bed and piles clothes upon himself, and yet, though he feels chilled to the marrow, his temperature is high. After an hour or so the hot stage sets in. His face is flushed, his pulse rapid, his breathing quick. His skin is dry and burning, there is intense headache, and oft-repeated vomiting. His distress is great if the attack is at all severe, and the thermometer registers perhaps 105°F. He casts his coverings impatiently aside and may go slightly off his head. For three or four hours he is in this stage of acute discomfort and then the sweating stage supervenes, the perspiration pouring from him and literally soaking everything on and about him. The fever rapidly declines and comfort takes the place of acute misery. Indeed, though tired, he feels quite capable of getting up and going about. Then, according to the nature of his infection, but usually two or three days later, the fever fit recurs, unless in the meantime quinine has been administered. The above is a classical form of intermittent malaria, and, naturally, repeated attacks of this kind soon render the patient weak and bloodless.

But acute malaria does not constantly conform to this type. It is as often as not atypical, and, as already stated, the subtertian or tropical form is apt to show a continuously elevated temperature. Persons who frequently get malaria, either in the form of fresh infections or of relapses, pass into a chronic state in which the anæmia becomes marked, the spleen enlarged and hard, the so-called "ague cake," the vitality depressed—a condition which is as hard to cure as it is to endure.

Spontaneous recovery from malaria can, and sometimes does, occur, but more frequently the parasitic enemy retires, as it were, into its dug-outs in the spleen and liver and its trenches in the bone-marrow, and awaits its chance of making another raid upon the defences, aided perhaps by chill or over-exertion, or excess of some kind. Then we have the above-mentioned relapse.

A word may be said about Blackwater Fever, because the view now most generally held is that it is merely a concomitant of malaria. If so, it is a most serious complication, which has slain many a pioneer of Empire. Even if, as some believe, blackwater fever is a disease *sui generis* and due to a parasite of its own, yet there can be little doubt that it is in some way or other associated with malarial infection. Perhaps malaria renders the red blood cells more fragile so that they are readily acted upon by some other poison, and so yield up their colouring matter, which, set free in the blood, is voided in the urine. It colours this secretion a shade of red, varying from that of a light claret to that of a dark port wine, and it is this change, striking and fear-inspiring, which has given the condition its name of Blackwater.

The kidneys get clogged with *débris*, and in addition to other serious symptoms, such as high temperature, jaundice, restlessness, and insomnia, there is a tendency to suppression of urine, which is often the cause of death.

Turning now to the distribution of malaria, we find that the disease is very widespread. Although now unknown as an indigenous disease in Scotland, Ireland, and Wales, it still lingers in some fenny parts of England, for three species of anopheles, all potential carriers of the parasite, are present, and a small number of locally acquired infections are reported every year. Moreover, as shown in the years following the recent war, if there are amongst the community considerable numbers of people harbouring parasites in their blood and if the temperature conditions are suitable, there may be outbreaks of the disease. In this connection it must not be forgotten that, as shown by James in his excellent book, *Malaria at Home and Abroad*, there arrive every year at English ports a number of cases of malaria, and some of these at least are potential sources of infection.

Nearly everywhere throughout the British tropics and subtropics malaria occurs, and in many places it is exceedingly common and a potent cause of morbidity and fatality. Its absence from certain islands of the sea, such as Barbados,

the Seychelles, Rodriguez, and some of the islands of the South Pacific, notably the Fiji group, is doubtless to be explained in terms of the absence of anopheles in these places, but in the case of some of them it is difficult to understand why ship-borne anophelines have not obtained a footing. Much more remarkable, however, is the occurrence of foci free from the disease and yet abounding in anophelines and surrounded by highly malarious tracts. Such conditions obtain in India and elsewhere, and we do not yet understand the cause of this immunity, though various theories have been advanced in explanation.

The disease is endemic in the northern part of Australia, its distribution apparently coinciding with that of a certain species of anopheline, and during and after the war many soldiers returned infected. As there are five species of anophelines known in Australia, some of them undoubtedly potential carriers, it is not surprising that a few locally acquired cases cropped up here and there out of the endemic area. Some alarm was thereby excited, for it was feared that the disease might spread, but a paper by Ferguson is calculated to allay fear in this respect, for he points out that the mosquitoes are relatively scanty in urban areas and that the population is scattered in the country districts. It is interesting to consider the chances of infection in any particular locality, but it is not easy to estimate them, for, as Ross has pointed out, they depend on several factors. These may be listed as the average population, the number of infected persons, the number of those whose blood contains enough sexual forms of the parasite to infect anophelines, the number of anopheles, the number of those which feed on a single person, the proportion surviving one week, and the proportion of survivors that bite again. Ross calculates that one-quarter of anophelines succeed in biting human beings, only a third of these survive a week, and only a quarter of the remainder succeed in biting a second person. Hence only one in forty-eight is ever likely to transmit infection, so that the danger in a country like Australia does not appear to be great.

With the knowledge now at our disposal, care should be taken to see that malaria is not introduced into British possessions which to-day are free from it, or we may have, in some degree, a repetition of what occurred in Mauritius.

There malaria was seen at its worst, the dread disease about which Shipley wrote picturesquely when mentioning the channel in the proboscis of the female anopheles.

"Down this microscopic groove," he wrote, "has flowed the fluid which has closed the continent of Africa for countless centuries to civilisation and which has played a dominating part in destroying the civilisations of ancient Greece and Rome."

He might have added :—

"which also prevented Ismailia from becoming the great port that de Lesseps intended it should be, which, along with the mosquito-borne yellow fever wrecked the French hopes and schemes at Panama and which has time and again, as at Walcheren and in Macedonia, brought to naught the operations of British armies in the field."

We may say also "of the British Navy," and in this connection would refer the reader to a most graphic account of what was known as the Batavian Epidemic of 1800, written by Shields, a naval surgeon, and included in the fourth edition of Johnson's *Tropical Climates* (1827).

Perhaps, however, the classical description of malaria in epidemic form is to be found in the pages of a book entitled *Sub-tropical Rambles in the Land of the Aphanapteryx*, written by Colonel Nicholas Pike, who was American Consul at Port Louis, Mauritius, in the late sixties of last century, and who was an eye-witness of the scenes he describes. Here is what he says :—

"Those who inhabited Port Louis during the terrible mortality in 1867 and 1868 will never forget the sad spectacles the city presented daily. Fever! fever! was the only word on every lip, the only thought in every heart. Mourning and desolation everywhere. Scarcely a person visible that did not wear the garb of woe. Song and laughter had ceased.

"Port Louis was once remarkable for the number of pianos heard in every street in an evening, from the Erard's grand and semi-grand to the humblest cottage instrument.

"At this time it was literally 'The daughters of music were brought low, and the voice of mourning was heard in the streets.'

"Funeral trains were met at every corner. Relays of men were kept night and day digging the graves.

"The owners of undertakers' shops that sold mourning, and the apothecaries, must have made fortunes. The numerous druggists' shops were so crowded day and night, and so short of hands, that it was with difficulty medicine could be procured. Offices were opened in all directions for the distribution of food, medicine, or advice to the destitute; but all the efforts made

by the municipality and private charities could not keep pace with the strident progress of the wretchedness and distress.

"There was no mistaking the appearance of one who had suffered: the pallid, drawn features, the skeleton, bloodless fingers, as if the bright life-stream had been dried out of them, and the slow dragging step marked but too plainly the victims.

"It was distressing to pass through the streets: in every corner was some poor creature, suddenly struck down, and crouching on the ground to die.

"In the outskirts of the city and country roads the victims were so numerous that the police and sanitary committees were insufficient to succour half the poor wretches, and many died by the roadsides before help could be brought to them.

"Near Roche Bois I have seen them lying in groups, dying and dead. Not a house, within a radius of half a mile from the one I then occupied, had a living person in it, except a shop belonging to three Chinamen, two of whom died later.

"In many cases, as soon as a Malabar got the fever, he would hasten to his house and shut himself in to die; for such was the fear of it, to be attacked was the tocsin of death to him.

"I visited many families, and the scenes I witnessed will never be effaced from my memory. A poor Indian, whom I had cured for the time being, came and entreated for help to a comrade. It was night, and I was tired and had gone to bed; but the poor fellow begged so hard that I dressed and went with him. After a long walk we came to a hut, and as I approached I heard groans and lamentations. When I entered, the scene baffled all description. A small cocoa-nut oil lamp dimly lighted the interior, adding horror to the scene.

"It was inhabited by a man and his wife, with a number of children. The mother lay dead in the middle of the hut, the man hanging over her in an agony of grief. Her baby, still living, was clasped to her heart, and seeking to draw its life-sustenance from her cold breast. The other children were all stricken with the fever, and in its last stages, past human help. Of course, all I could I did, but help had come too late to do little more than assist in their burial.

"One dreaded to ask the news, as one was quite sure to hear of some friend ill, dying, or dead, and often buried before you knew of it. Parents had to rise from their sick beds to nurse their children, and these again had to drag their weary limbs to follow a beloved parent to the tomb, though frequently too weak even to do that.

"No change of weather seemed to arrest the plague. Intense heat or cold, heavy rains or dry, mild calm days, or sharp breezes, all were alike fatal. The brightest morn brought no more hope than the wildest night.

"For months the death-rate in the city alone averaged nearly 200 *per diem*. In every street could be seen the mourning weeds outside the doors where death had struck his victim, and this was often the first intelligence you had of the loss of dear friends—no time for ceremony then. May I never witness again the sad sight of those incessant funerals, slowly wending along from morn till night.

"Here a group of Malabars bearing along some poor fellow, preceded by a priest muttering a prayer, and followed by a few women bearing a copper dish of rice and fruit, and a jug of water, to place on his grave.

"There comes a slow and stately train with black-plumed hearse, and a long line of carriages behind it—one of the rich and respected of the land; anon, a little simple bier, bearing a baby's coffin covered with a simple white muslin pall and wreath, with perhaps only the father and nurse as mourners; then a white-covered hearse, its white plumes and the horses' sweeping trappings showing that some fair girl had been cut off in early womanhood.

"Occasionally would pass a Chinese funeral, the bier supported by stout Malagash bearers, in their long black gowns and flowing weepers looking as stolid as if of stone; a few carriages following with Chinamen in them, and a person always preceding it, scattering pieces of paper about three inches square, often gilt or silvered, all along the road, to scare away evil spirits and prevent their following the corpse to its last resting place."

It is believed that no fewer than 31,920 persons perished in the little colony as a result of the visitation.

In other countries, and more especially in India, malaria every now and then flares out in a virulent and rapidly spreading form. Such outbreaks attract attention and cause much damage, but it is what we may call the everyday malaria which is the truly "Imperial" disease, the chronic relapsing malaria which saps life and energy, alters mentality, and leads to invalidism and poverty. A malaria-sodden population is a sad sight, bloodless, breathless, listless, often with big spleens which contrast with the general emaciation. It is a case of tired minds in tired bodies, and naturally under such conditions there can be no efficient labour. Looking at things merely from a mundane point of view, there is a loss of time and money. The worst of it is that this goes on year in and year out, so that the burden of expense due to lack of efficiency, hospital charges, doctors' fees, drugs, and other causes, attains surprising dimensions. Yet, in

most places, all this is permitted to go on, though it is many years since Ross made his discovery and though in many localities persistent work along the lines he has indicated will keep the disease in check. These are, of course, the broad lines of action whereby the disease is combated on a more or less extensive scale by waging war upon its mosquito vectors, chiefly during that part of their life-cycle which is passed in water; in other words, measures directed against mosquito eggs, larvæ and pupæ. They have been applied with marked success in Cyprus, at Ismailia, at Khartoum (though of recent years the occurrence of heavy and continued rains and the deplorable fact that certain precautions were abandoned, have caused their temporary failure), and, most strikingly of all, in the Federated Malay States, to take only a few outstanding examples.

In discussing precautionary measures, however, it is well to classify them and to consider each method separately, though exigencies of space necessitate a very brief survey.

An excellent classification is that given by James in his book, to which reference has already been made, but for our purpose it will suffice if the preventive measures are classed as personal and general.

Personal Prophylaxis.—Much the best way of escaping infection is, of course, to avoid being bitten by infected mosquitoes. This is more easily said than done, but in a malarious country it should be the rule never to sleep save under a good mosquito-curtain or "bar," as the Americans call it, and by a good mosquito-curtain is meant one of a proper shape, of satisfactory material, of correct construction, with a mesh which, while it keeps out all mosquitoes, admits as much fresh air as possible. The best shape is a rectangle, and the net should be so constructed that a stout band of calico, say two feet in depth, is sewn round its free edge. One foot of this must be tucked under the mattress and the other serves as a protection to the sleeper, whose bare arms and legs are apt to come in contact with the mosquito-curtain, especially if the night be hot and the bed narrow.

It is of the greatest importance that the net be hung inside the poles or bed-posts. It should be stretched tight to favour the passage of air through its meshes, and it must be kept in a good state of repair. A net full of holes is really worse than no net at all.

When not in use it must be folded and hung out of the

way in such a manner that mosquitoes cannot get inside it, and, as an additional precaution, when one retires to its shelter, a careful search should be made, preferably with an electric torch, for any winged intruders.

If such a luxury as a large electric fan suspended from the ceiling is available, it may be possible to dispense with a net, for mosquitoes hate a draught, but one must be very sure that the fan is efficient and capable of being used without inducing chill.

Of course a properly screened room may take the place of a net and is much more agreeable, but the cost of such screening is often prohibitive, and in any case it is very necessary to make sure that the screened room has not become a trap for hungry blood-suckers.

It is interesting to recall the fact that long ago Cretan fishermen were wont to protect themselves from fever by sleeping under fishing-nets folded and refolded until their meshes were much reduced in size. This they did to exclude the dreaded miasma, which then, and for centuries afterwards, was generally supposed to be the exciting cause of the marsh fever.

Head-veils, gloves, boots, and buskins are all employed to afford protection. Of these, boots are the most important, and in certain parts of the world, as, for example, the Upper Nile region, it is essential, for men at least, as soon as darkness approaches, to don long boots reaching to the upper part of the thigh. For women boots reaching to the knees will suffice. Mosquito-boots should be furnished with soles and should be loose and comfortable. By repellents are meant substances which can be smeared on the skin and which are objectionable to the mosquito. None of them is very effective. The majority contain some form of odorous essential oil, but though they keep the insects at bay for a short time they have to be frequently renewed. They are not as a rule very agreeable to use, but possess a limited value.

Of course, where it can be managed an effort should be made to avoid human sources of infection. In the tropics native villages are often dangerous foci, for the children in them frequently act as reservoirs of the parasite. Hence it should be the rule to sleep well away from those who can furnish mosquitoes not only with blood but with malaria parasites capable of being transmitted to others.

An auxiliary method of personal prevention, which in civil life is undoubtedly of value if properly carried out, is

the regular taking of quinine in order to destroy any parasites which may be introduced into the blood. A great controversy has been waged about the value of this quinine prophylaxis, as it is called. Some say that quinine taken for any length of time is itself detrimental to health, that it upsets digestion, that it may cause deafness. Others allege that it is a mistake to take it in this way because, supposing parasites do effect a lodgment, they become habituated to the drug; consequently, if an attack of malaria supervenes, it is found that these so-called "quinine-fast" plasmodia cannot be destroyed by the doses of the drug which are usually employed in treating the disease.

Where, however, under ordinary conditions, quinine prophylaxis fails, it will usually be found that the method has not been pursued in a scientific manner, or that some other factor has been present to militate against success.

The more common causes of failure are faulty dosage; secret avoidance of taking the quinine, either from prejudice, or dislike of the taste; taking it at the wrong time of day; incomplete absorption of the drug owing to digestive trouble, the use of an insoluble preparation or one that is not up to standard strength. Frequently also prophylaxis is begun too late, infection has already occurred.

It must be remembered that true quinine prophylaxis aims at always having sufficient quinine circulating in the body to kill the young forms of the parasite, the sporozoites, whenever they are injected by the mosquito. Of course it is possible to receive such enormous doses of sporozoites that no reasonable amount of quinine can cope with them. Then some will survive and gain access to the red cells, and eventually multiplication of the parasites will occur to such an extent that an attack of malaria will be induced. Some of these parasites may also possibly become quinine-resistant. We may expect such happenings in time of war in intensely malarious localities, and also when the natural bodily resistance is lowered owing to unfavourable local conditions, such as insufficient or poor food, exposure, over-exertion, and so forth. In every-day life in the tropics, however, where the risks of infection are slight or moderate, quinine properly taken can, in most instances, accomplish what is required of it. At any rate it should be given a chance, more especially if, as sometimes happens, a mosquito-net is not available. Most anophelines carry out their nefarious work between sunset and sunrise. They attack especially at dusk and also

just before dawn, and these are the times when quinine should be present in the blood. Hence, as quinine, though quickly absorbed into the blood, is soon excreted from it, the ideal times to take the drug are in the evening, about an hour before sunset, and in the middle of the night. Naturally it is not easy to fulfil the latter condition, but if one uses a net the second dose is not necessary. Hence it usually suffices if a dose of good soluble quinine is taken at dinner-time. It is better taken with food, as it is then more easily tolerated and perhaps more readily absorbed. A five-grain dose is generally sufficient, but when the chances of infection are great ten grains may be taken.

In addition to this "true quinine prophylaxis" there is a so-called "relapse prophylaxis," that is to say, the drug is taken to prevent fresh attacks of fever, by some one who has already had malaria and harbours the parasites in his body. This is quite a different procedure, and quinine is not so effective in this direction, though it is often useful.

General Prophylaxis.—By this is meant the protection of communities. It is too large a subject to be considered here in anything like detail. Moreover, the choice of measures to be adopted will depend on various factors: the type of population to be safeguarded, the climate, the local conditions as regards mosquitoes and their habits, the money available, and the staff and equipment at the disposal of the hygienist.

As James very pertinently points out: "No policy can be considered entirely satisfactory that aims at the protection of only a few, however important these few may be, while it leaves the bulk of the inhabitants of a place in the same condition." This is very true, but too often the coat has to be cut to suit the cloth.

Just as in war all combatant branches of an army service are utilised, infantry, cavalry, artillery, engineers, tanks, gas, and flying corps, so in combating malaria on a large scale it is desirable to put every measure into force which is likely to be useful. Very often, however, this is not practicable, though it is usually feasible to employ several at one and the same time. There is a considerable variety of methods from which the choice can be made.

As in the case of the individual, quinine prophylaxis may be adopted, but naturally it is very difficult to carry this out on a large scale in any community which is not under discipline and efficient surveillance.

Sometimes it is found best to limit it to school children who can be more or less controlled.

Another way of employing quinine communally is to restrict its administration to persons who are actually suffering from malaria, and those who, harbouring parasites in their blood, are classed as "carriers."

These latter may exhibit no symptoms whatever and yet be dangerous to the public. Indeed this is very likely to be the case, for the form of parasites circulating in their peripheral blood is very apt to be the sexual type which does not cause either fever or any other symptom in man. As we have seen, it is there to get the chance of transference to its mosquito host. It is, of course, difficult to administer quinine on a large scale, and calls for a considerable degree of organisation, but it can be done and should be done in countries where the poor native population is riddled with malaria.

As regards anti-mosquito measures, which usually cost a good deal of money, the question must always be asked, as Ross himself pointed out, "Is the game worth the candle?" In many places it is, in others the results which might reasonably be expected to accrue would not justify the expense, in yet others the conditions may be such as to preclude any possibility of success.

It is impossible to give details of all the various methods employed for combating anophelines. It should, however, be remembered that the aim must, as a rule, be reduction, not extermination, for the latter is practically unattainable. Measures may be directed against the adult mosquitoes, or against their water-stages.

The adults or *imagines*, as they are called, may be caught by hand, and it is an advantage to soap the hands, as this facilitates capture. They may be taken in test-tubes, in nets, by means of small aspirators, in traps of various kinds, or they may be stupefied or killed by fumigation or spraying. Short of destruction they may be driven out of dwellings, or the interior of rooms may be made repellent to them by the use of such a substance as creosote oil. Their natural shelters may be attacked, and for this purpose resort is had to clearing and the provision of so-called dry zones or open belts in the vicinity of towns or villages.

Another method—originally suggested by Grassi and other Italian observers early in this century and recently revived and strongly advocated by Roubaud in France—is

the utilisation of domestic animals, notably cattle, pigs, and rabbits, as protective agents. Some anophelines, especially perhaps the common European species, *A. maculipennis*, prefer animal to human blood; hence, under certain conditions and with certain precautions, "animal screens" can be employed. It is interesting to note that Cragg in India has suggested that the occurrence of epidemics of malaria in India may possibly be explained in terms of the attraction which cattle exercise for anophelines. It has been shown that outbursts of malaria coincide with heavy rains following drought. Now during drought in India native cattle, which live in close association with the inhabitants, perish in large numbers. Cragg's view is that the anophelines normally derive their blood nutriment from cattle, and that dearth of these animals following drought and famine drives them to seek the blood of man with disastrous results to the population.

Our knowledge regarding this zoophilism of anophelines, as it is called, is still defective, but there is some reason to think that preventive measures based upon it will prove successful, if properly carried out.

The commonest and most effective method of tackling mosquitoes is to attack them in their water-stages. From the egg comes the larva, and the larva changes into a pupa or nymph, from which the imago or adult insect emerges. Now both larvæ and pupæ require air. To obtain it they must periodically seek the water surface. The larvæ breathe through tiny openings in caudal papillæ, the pupæ through special hollow structures fashioned like ear-trumpets. It was found long ago that if a film of oil be distributed over the water surface, the access of air to larvæ and pupæ is prevented and accordingly they perish. Petroleum was used at first, but there have been many modifications in the form of oil employed with the object of getting a good thin tenacious film which would spread rapidly and completely and would to some extent resist the action of wind. There is reason to believe that the oil film not only prevents the access of oxygen but acts as a direct poison to the mosquito larvæ. More effective poisons, however, can be found in substances which mix with the water, as, for example, cresol, or the preparation known as sanitas okol. Cyllin in the proportion of a teaspoonful to a gallon of water is also a useful larvicide.¹

¹ More recently Paris Green, an arsenical preparation, in the form of a powder mixed with road dust has come largely into use. It can be safely employed and is valuable under certain conditions, being alike effective and economical.

In the case of wells an interesting new development has arisen from the researches of Williamson, who has found that mosquito larvæ and pupæ in well water can be destroyed by generating poisonous vapours or gases within the well. This method has the advantage of not polluting the well water, and when properly carried out appears to be quite efficient; it should be specially serviceable in a country like Palestine, where the numerous wells form important nurseries for anophelines.

For a good many years fish have been employed as a means of destroying the water-stages of mosquitoes. Perhaps the best known are the little "millions" of Barbados which at one time used to be distributed to other countries for the purpose, until it was found that most localities already possessed larvivorous fish which, moreover, had the advantage of being acclimatised, while the Barbados millions were very apt to come to grief in their new surroundings.

Lately the use of eels has been advocated, and they possess several advantages, as they are able to exist in places where fish can hardly survive, they are cheap, easily handled, and stand transport well.

Where it can be managed, a more thorough means of dealing with mosquito breeding-places is to abolish them altogether. As a rule this is easy enough in the case of certain pools and household utensils, but it is a more difficult matter where the mosquito nurseries are extensive, as, for example, swamps, rice-fields, and marshy areas along the banks of streams. Where household vessels and cisterns cannot be periodically emptied they can at least be suitably covered or screened to prevent the access of female mosquitoes intent on egg-laying.

Rice-fields can be treated by periodical drying in regular rotation. Natural swamps, marshes, morasses, ponds, and other large collections of stagnant water may be dealt with by drainage on a large scale or by filling them up. Occasionally it is possible to pump water collections dry, but naturally this is an expensive method and is not generally applicable. In some instances it may not be necessary to proceed to such drastic measures, as by deepening a swamp, clearing it of vegetation, and rendering its margins hard and smooth, it may be possible to make it unsuitable for mosquito breeding operations.

In Alabama a method of vertical drainage has been adopted which has proved quite effective in the abolition of

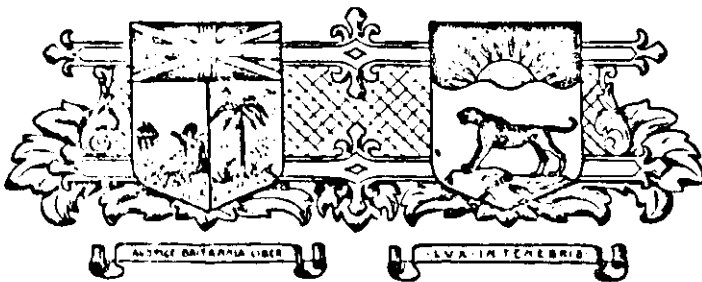
a large pond that was formerly a nuisance. By vertical drainage is meant the sinking of a shaft from the bed of a pond through the subjacent strata. Down this the water will find its way. Such a method can, of course, be carried out only when the deep strata consist of limestone, chalk, or some other formation which favours absorption.

Minor forms of breeding-places to which attention must be paid are defective roof gutters, rot-holes in trees, stumps of fallen bamboos, and plants which hold water. These must be dealt with on common-sense principles; details can be found in any good work relating to malaria prevention.

The above is but the briefest survey of the chief measures which are adopted in the attempt to control malaria. No malaria campaign, and more especially no mosquito campaign, should ever be entered upon light-heartedly. Full data must be collected before anything is done, and it is well to bear in mind at all times the truth of the old adage, "Haste is begotten of the devil." At the same time, once the measures to be followed have been carefully chosen, the campaign, on whatever lines it is conducted, should be prosecuted with despatch, a well-regulated enthusiasm and unremitting care. It must be remembered that only very occasionally in the case of anti-mosquito operations will it be possible to fold the hands and say complacently, "It is finished." The anopheline enemy, prolific, persistent, and perilous, nearly always takes advantage of any slackening in the efforts directed against it.

This, of course, is specially true of what may be called the moist tropics, where there is a definite rainy season. In the dry tropics malaria can in many places be combated with comparative ease and with results which soon make themselves apparent; the campaign against it is quite another matter in places where the rainfall is abundant. At the same time, even in such places, there is no reason to despair. As a rule it is not a question of rendering a whole country either malaria-free or mosquito-free, but rather one of rendering comparatively healthy some special place which, owing to its commercial significance or its importance as a centre of population, merits particular attention and deserves to have time and money expended upon it. The greatest foe to malaria, however, is undoubtedly the progress of civilisation. As land is drained and cultivated, provided always agriculture is carried out on proper lines, malaria recedes into the background. This method, however, of

conquering the disease is naturally a slow one, and in many places it would be unwise to wait patiently for its success. It is necessary to be up and doing, for malaria all over the Empire is taking toll of human life and playing havoc with energy and vitality. We know how to get rid of this enemy of mankind, because we are acquainted with its cause and its mode of spread. Money and persistence will often work wonders, but in this case, as in very many others, little can be done in a general way until the lay public has been educated along sound lines. By the lay public is meant not only the man in the street but those responsible for the good government of our colonies and dependencies throughout the world. There is still a lamentable lack of appreciation of all that has been done and can be done, but the outlook is infinitely more hopeful than was the case even ten years ago. There is no reason for despondency, even if the hygienist must preach in season and out of season the desirability, nay, the necessity, of applying our knowledge to the rooting out of one of the most crippling and widespread of the diseases which afflict mankind.



Arms of

Sierra Leone.

Nyasaland.

CHAPTER VII

PLAGUE

PLAGUE, the "Black Death" of the Middle Ages, has certainly the right to rank as one of the "Imperial" diseases. It is true that, thanks to advances in our scientific knowledge, it is now unlikely that this malady can ever obtain more than temporary footing in countries where there is a well-organised sanitary service. Plague, indeed, has, as it were, knocked time and again at the gates of Great Britain and Australia, but although it has occasionally effected a lodgment, it has always been stamped out in a comparatively short period. On the other hand, there are many parts of the Empire in which plague is constantly present, and where it is responsible for much sickness, many deaths, interference with commerce, and the expenditure of large sums in more or less inefficient methods of combating it.

Plague exists primarily as what is termed an epizootic disease in rats and other rodents. It is due to a bacterium—the small, somewhat spherical-shaped *Bacillus pestis*—which has the power of producing, both in the body and also when cultivated in artificial media, a most virulent poison, the so-called plague toxin.

There are two chief types of plague, known respectively as the bubonic and the pneumonic. The bubonic type is the commoner and the less severe. It is characterised by the presence of buboes, which are inflammatory enlargements of the lymphatic glands, the groups of glands usually affected being those in the inguinal, or rather the femoral, region. True pneumonic plague, on the other hand, is primarily a disease of the respiratory tract. It is invariably fatal and is one of the most terrible maladies which can attack a community, especially if such community lives under insanitary conditions.

There is also a so-called *Pestis minor*, or ambulant plague, which, though not dangerous to the individual suffering from it, is important inasmuch as those attacked can go about and spread infection.

In the bubonic form the bacillus of plague is, as a rule, conveyed from rat to man by the rat-flea. It is known that



Courtesy of Mr. Cecil A. Hoare.

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Death in the form of plague approaching a doomed city; a realistic representation conceived by Professor E. Pavlosky, Military Academy of Medicine, Petrograd, and drawn by P. Vegin.

fleas leave their rat hosts when the latter die, as they not infrequently do, from rat plague. Fleas infected from the rats seek fresh hosts, and often find them in the shape of human beings, to whom they convey the disease, not directly by their bites but by means either of their œsophageal contents regurgitated upon the skin or by their bacillus-containing fæces voided upon it. In either case the bacillus gains access by the minute wound produced by the bite of the flea, or possibly by tiny lesions resulting from the scratching induced by the irritation caused by the presence of the insect.

The two species of rat most commonly concerned in the transmission of plague are the black rat, often called the old English black rat, and the brown or Norway rat. The black rat is the more dangerous, as it lives in closer association with man. As already indicated, other rodents may be operative in spreading bubonic plague. In French West Africa, for example, the shrew has been proved to be a carrier, while in South Africa of recent years quite a large number of rodents have been shown to suffer from plague and to be possible transmitters of the disease to man. Moreover, domestic animals, such as cats and dogs, may acquire infection. The frequent association of rats with grain, and, to a smaller extent, with raw cotton, must be borne in mind not only as explaining the spread of the disease but because these and other forms of merchandise are more to be dreaded as vehicles of plague infection than the human being *per se*. On the other hand, in pneumonic plague, it is the human patient who is all-important, because in this form of the malady infection is transmitted from the sick to the healthy by droplets of sputum expelled in coughing, and possibly also by the invisible spray which pneumonia patients discharge from the mouth. It may be noted that in times of epidemic domestic animals may suffer from pneumonic plague and become sources of infection.

Although the plague bacillus is not specially resistant to external conditions, it may remain alive in the rat-flea and be capable of causing infection for as long a period as forty-three days. It is a very interesting fact that when the flea sucks up blood containing plague bacilli these multiply in the blood-clot at the fore part of the stomach, with the result that both the gullet and the stomach become blocked by the bacillary mass. This prevents access of food to the flea and hence the starving insect makes violent efforts to get more blood and regurgitates its œsophageal contents, thereby, as

we have seen, providing ready means of infection. If the weather is dry such a blocked flea is very apt to die, presumably from lack of food. Perhaps this is the reason why plague does not maintain itself in epidemic form when the temperature rises above 80°F. and there is a certain deficiency of moisture in the air.

Severe plague in either of its forms is a dramatic disease, and in the Middle Ages was wont to strike terror into the beholder. As a rule it takes from two to eight days to develop after infection.

In both the bubonic and the pneumonic forms the plague bacillus may invade the general circulation, and then we have what is known as septicæmic plague, a very serious though not necessarily fatal form of the disease. In all forms of plague, except the mild *Pestis minor*, there are certain characteristic symptoms, namely, sudden onset, sharp fever, giddiness, rapid prostration, a gait, appearance and speech suggesting those of a drunken person, and a tendency towards heart failure.

In bubonic plague the patient develops headache and drowsiness, his face becomes pale and anxious, his features are drawn and haggard, his eyes bloodshot, sunken, and staring, his expression is often one of fear or horror. This aspect of the plague countenance has indeed been well brought out in several famous pictures. So long as the patient can walk he drags himself about in a dazed state, or staggers hither and thither like a drunkard. As his temperature rises his face becomes hot, flushed, and bloated, and his pupils dilate. The tendency to heart failure is shown by the rapid and weak pulse. There is intense thirst; the tongue becomes dry and brown, the mouth and nostrils dirty. Delirium and even convulsions may ensue. By the second or third day of the illness the bubo or buboes make their appearance. The group of glands involved depends on the part of the body where the original infection took place; hence a foot or leg infection leads to inguinal involvement, while if the channel of infection has been in the hand or arm the glands in the armpit become enlarged. Buboes may also occur under the jaw, in the neck, and elsewhere. These buboes increase in size and, if not opened, finally soften, burst, and discharge pus and sloughs. When the case ends fatally death usually takes place between the third and fifth days; otherwise, about the sixth to the tenth day the temperature falls, the buboes subside, the patient improves, and convalescence is not long delayed. There are severe forms of

bubonic plague with hæmorrhages and other grave conditions which need not here be discussed.

The pneumonic form is usually heralded by shiverings and vomitings; a cough develops, there is breathlessness, a bluish tinge of the lips, and possibly also of the skin; the patient begins to spit up a profuse watery, blood-tinged sputum. This sputum teems with bacilli and is exceedingly dangerous. The disease is most toxic and in a short time the patient is completely overwhelmed; he never has a chance, and rapidly dies, with his temperature still elevated.

As in the case of cholera, the chief home of plague in the British Empire is India. The disease has been known in that country since 1815, and there have been several epidemics, some of them severe. All of them, however, shrink into insignificance compared with the outbreak from which the country is still suffering and which is traceable to foreign invasion.

It was only in August, 1896, that India was declared infected, the disease reaching it from the Far East and appearing first in a part of Bombay near the docks. Thence it spread, slowly at first, then more rapidly, slaying its thousands and tens of thousands in towns and villages, more especially in Bombay Presidency, the Punjab, and the United Provinces. In almost any other country but India such a dreadful visitation would have terrified the inhabitants and brought communal life to a standstill, but in the great peninsula the immensity of the population militated against any general tendency to panic, as did the fatalism of the people, many of whom at the best have a comparatively feeble hold on life. Since the great epidemic began fully eleven million persons have perished from plague in India. Quite apart from this appalling loss of life there has been occasioned a vast disability from sickness and a very considerable dislocation of trade and traffic.

It is amazing how people have become used to plague in India and think but lightly of it. If, however, the monetary loss to the Indian Empire alone occasioned by the disease—to say nothing of the enormous damage to food-stuffs caused by the plague-carrying rat—could be set down on paper, a figure would be forthcoming which, if it did not shock and stupefy, would fail to do so only because its magnitude baffled comprehension by the ordinary being. It is curious how some parts of India have wellnigh escaped. As Hirst has shown, this may be due to the fact that in these localities the common species of rat flea differs from that

which occurs elsewhere. In other words, *Xenopsylla cheopis*, the rat-flea and the plague-flea *par excellence*, is replaced by *Xenopsylla astia*.

It is, however, no wonder that *Bacillus pestis* finds a happy hunting-ground in India. The conditions there are precisely those under which it flourishes, those which favoured its propagation and spread in mediæval Europe. Choksy of Bombay has recently written a series of admirable articles on "Plague in India." In one of them he takes two quotations from British authors and places them alongside each other. The result is so suggestive and illuminating that we follow his example:—

*Physical and Social Conditions
in England in the Fourteenth
Century.*

Sir J. Y. Simpson and Sir Joseph
Fayrer.

*Physical and Social Conditions
in the Punjab and the United
Provinces in the Nineteenth
and Twentieth Centuries.*

Dr. Francis. (Quoted by Dr.
Norman Chevers.)

"In England the food consisted of salted provisions, rye bread and practically no corn. Cultivation and gardening of vegetables was not taken up till the sixteenth century. In all the towns of Europe the streets were unpaved and ill-constructed. Filth was thrown into the streets. Vaults and common sewers were non-existent, and drains ran above ground. Scavenging was imperfectly understood or neglected. The water supply was deficient, the streets narrow, preventing free circulation of air. Internal domestic arrangements of the houses were injudiciously placed, and there was great overcrowding.

"The streets of London were filled with filth and garbage. The houses of the people were wooden or mud houses, small and dirty and without drainage or sanitation. The

"A small stone dwelling (built upon a surface thirteen feet square) consisting of two rooms each about five feet high, one above another—the upper chimneyless and practically windowless; tenanted by the entire family, often more than a dozen in number, and by the huge baskets containing the family grain; the lower compartment (a wooden floor full of cracks, serving as media for the effluvium from below, dividing the two) being occupied by the family herds consisting of cows, goats, and pigs: a row of such dwellings (sometimes they are single or double) spread over an irregular surface, similarly tenanted and flanked at either extremity by the ancestral heap of manure, from which streamlets of liquid filth were flowing in different directions: the cottages covered with cucurbitaceous

floors were of earth or clay, and were covered with rushes, straw, and other rubbish which were occasionally renewed, but underneath those lay unmolested an ancient collection of beer, grease, fragments of fish, spittle, the excrement of dogs and cats and everything that was nasty. Close by the door stood the 'midden,' a collection of every abomination, streams of filth from which polluted the houses and neighbourhood, including any river at hand. People lived in a crowded state and knew little of decency, cleanliness, or order. The standard of existence and morality was very low. In the fourteenth and the fifteenth century, soap was scarcely used at all, and it was a luxury to the labourer, who could barely afford to buy any. He lived in dirt, slept upon heaps of decayed matter, and had no fresh vegetables to eat. Only a few cabbages could be obtained, and also onions, parsnips and carrots and some kind of beet or turnip. Potatoes had never been heard of in the thirteenth century. Meat was scarce, and for months people consumed salted meat and fish that had suffered from keeping. There was much storage of salted food in mediæval England, and in the Midlands, away from the coast, much salted fish was eaten. In fact, fish was a great article of consumption. The bacon generally was rancid, and ham was alive with maggots. White bread was a great delicacy. The clothing consisted of skins and woollen stuffs."

creepers: a small forest of hemp, some eight or ten feet high, luxuriating in the immediate neighbourhood of the village, a growth of underwood including nettles, etc., between the two, and more or less surrounding the latter: and an unwashed pater-familias, seated in front of his fig-tree having submitted his head to be divested by a faithful spouse of the light infantry skirmishing in his unkempt hair.

"Conceive such a village," says Dr. Francis, "situated towards the base of a mountainous slope, well within the range of whatever noxious influences may emanate from the valley below; located where there would be the veriest minimum of ventilation, and we cannot be surprised if, when sickness does come, it should run rampant. The atmosphere and peculiar smell in these localities must be 'encountered' to be appreciated. They are *sui generis* and very suggestive of disease."

[Our more recent knowledge discounts, of course, the noxious influences emanating from the valley, a statement which evidently refers to miasmatic vapours, but otherwise the description is both graphic and accurate.]

But India is not the only part of the British Empire where plague exists ; Burma, or at least part of Burma, suffered along with India. Ceylon was infected from Negapatam in Southern India ; the disease started in Colombo in January, 1914, infection being conveyed almost entirely in large shipments of rice. Mauritius, a colony having frequent maritime communications with both India and Ceylon, was infected in 1899, according to some, from Madagascar. The disease spread from Port Louis and by 1909 had caused nearly 5000 deaths. Since then it has not been so much in evidence, and at times the island has appeared free from it, but there can be little doubt that all along it has continued to lurk in the rats, so that it is not surprising to find it breaking out amongst the human population after intervals of absence or quiescence. It is a serious and troublesome disease in a colony like Mauritius, which is so dependent on its overseas trade.

Here, as in India, there is some hope that the rats are acquiring an immunity to infection, and that in this way there will be fewer opportunities for its spread.

Other parts of the British Empire plagued by plague are Australia, Hong Kong, Iraq, Palestine, Kenya Colony, Uganda, Nyasaland and South Africa ; but the disease, unless carefully watched and guarded against, may crop up anywhere provided the climatic conditions are not inimical to its dispersion, as may very possibly be the case in very hot, dry countries like the Anglo-Egyptian Sudan.

And now as to preventive measures. The prophylaxis of plague will never be an easy matter, for we are up against the rat, and man possesses no more cunning and prolific enemy than this ubiquitous rodent. The fact that so many methods have been devised for its destruction is in itself evidence that the problem is a difficult one. It is true that persistent and well-organised methods of killing by gangs of men and dogs, trapping and poisoning on a large scale, are beneficial, and that the encouragement of natural enemies of the rat is to be commended, but such efforts possess only a certain degree of effectiveness. In restricted areas it is possible that the Rodier scheme may operate well. This consists in trapping the rodents, killing the captured females and setting free the males. The number of females being thus reduced, the males fight for the possession of mates, and both males and females perish in the process. The true value of such a biological procedure has, however, still to be gauged. Undoubtedly the most effective means of dealing with the animals is to

build them out, in other words, to construct human habitations, and more especially food stores, in such a way that rats cannot gain access to them. So far as grain godowns in India are concerned two types have been considered. One is rat-proof, the other rat-free. The former, which is expensive and difficult to build, prevents the entry of rats. The latter, while admitting the rodent, is so designed that it cannot remain therein, as food and water are unobtainable.

The principle of rendering houses rat-proof has perhaps been followed out in the most logical and extensive manner in Java, where, as Elkington says :—

“ The methods of plague control . . . afford an example to the world. They are clear cut and definite, nothing is left to chance, they are based on accurate observation of the actual conditions to be met, they are carried out with common sense and intense thoroughness in every detail, they are not hampered by official jealousies or by any underlying contempt in high places for ‘ those bally faddist doctors,’ and they are financed and considered like any other obviously necessary undertaking of Civil Government. The view is officially accepted that if it is necessary to rebuild every village in Java to get rid of the plague, every village must be rebuilt. The Dutch authorities admit that it may take a long time and a great deal of money, but they refuse absolutely to accept plague as an ordinary feature of their colonial landscape in the twentieth century.”

It is true that the thatched and bamboo houses in Java lend themselves to preventive methods, but it is high time that in many of our possessions we should take a leaf out of the Dutch book. Certainly a great deal has been done in India, which presents a much more difficult problem than Java, but elsewhere we have too often merely played with plague. There has been a lack of earnestness and thoroughness in our operations and a tendency to be as fatalistic in the matter as the Hindu himself. Still, signs of an awakening are not wanting. The plague problem has been tackled with considerable energy both in Uganda and Kenya, especially in the latter, where the disease has gradually been assuming formidable proportions and is seriously threatening the economic welfare and development of the country. In South Africa also the health authorities are fully alive to the need for intensive work, and the same is true of Australia, where of late years there has been much hygienic activity.

At the same time we are hampered by the lack of any

reliable and really effective means of checking the rat, and if only a method could be found whereby it could be attacked on what we may call its reproductive side great benefit might accrue. In other words, if only it were possible by some easily applied means, capable of ready transmission, to interfere in a more or less automatic manner with the rats' family life, preventing conception or producing abortion there would be some hope of dealing with the vermin in an effective way. No such method has so far been devised, but efforts have been, and are still being, directed towards this end, and it is not impossible that they may yet be crowned with success.

Fleas should be combated as well as rats, and more attention should be paid to them, or at least a certain species of them, than has been the case in the past. Apart from destroying them by fumigation with sulphurous acid gas (Clayton process) or the very lethal but dangerous hydrocyanic acid gas, means chiefly employed on shipboard and designed to slay both the fleas and their rat hosts, fleas must be killed in the material where they harbour; hence the necessity for the destruction or disinfection of clothes, skins, rugs, cotton bales, grain and rice sacks (gunny bags) and so forth. Chemical methods, such as the use of fluids like Pesterine, which contains kerosene, and powders like naphthaline have their value, while simple forms of flea-traps can be employed. There are various other prophylactic measures, some of a personal, some of a general kind. Plague patients must be isolated. Attendants on them should wear leather or rubber gloves, overalls, and be protected about the feet and ankles by means of putties and gum-boots. No food or drink should be partaken of in plague wards, and disinfection of the hands should be practised. Persons engaged in anti-rat campaigns should also be suitably guarded against the attacks of infective fleas. Rat-guards should be placed on the mooring hawsers and cables of ships; in Australian ports great stress is laid on the value of throwing a bright light on ships' sides and gangways at night. Good rat-catchers make very useful additions to ships' companies.

In outbreaks of pneumonic plague the freest ventilation is necessary, for it is in close atmospheres saturated with moisture that infection most readily takes place. Those in contact with cases of pneumonic plague must wear masks, goggles and overalls.

Happily, thanks to the researches of Haffkine, we possess a prophylactic vaccine the value of which, when properly administered in sufficient doses, has been proved time and

again. It consists of the killed bacilli and the chemical products of their growth in broth, and has been extensively used in India and elsewhere.

This necessarily brief and imperfect account of one of the most important of the Imperial Diseases, so far as overseas possessions are concerned, can give only a general idea of the havoc wrought by plague in its epidemic form, and the worry and loss it occasions in its endemic manifestations. One has to live with plague, as it were, to be able to appreciate its true significance, and one has to study the past to apprehend how man has gained the mastery over a disease in the presence of which he used to be practically helpless and usually woe-fully dismayed. Yet the mastery is far from complete in countries where there are ignorant and often superstitious native populations; and it never will be complete until we, like the Dutch, take plague seriously and regard its presence as a stigma upon our sanitary escutcheon. It is not only native populations who require education as regards plague and its prevention. Lay administrators are in need of instruction, and they must be familiarised with what can be accomplished if money and personnel for the fight are forthcoming. The failure of the faulty or inefficient methods too often employed by sanitarians in the past and due sometimes to ignorance, sometimes to lack of money and encouragement, sometimes to deficiency in driving power and enthusiasm, has itself to some extent alienated the sympathy and lessened the interest of those in high places who are charged with administrative duties and the control of the distribution of funds.

Hence it is imperative that there should be a clear understanding of the matter and that all in any way responsible for fighting plague should know what can reasonably be expected in the present state of our knowledge and resources.¹ That expectation will differ in different places, but there exists an abundance of literature on the subject, covering practically all contingencies which have to be faced. Plague is, or rather should be, an anachronism in the twentieth century, save perhaps in a few countries where there are wellnigh insuperable difficulties in the way of suppressing it. There is, however, reason to hope that ere the close of that century plague, if not extinct like the dodo, will at least be as rare as is yellow fever at the present day.

¹ New light appears to have been thrown on the matter by Dr. Norman White in his important report to the Health Committee on the League of Nations dealing with Epidemic Disease in the Far East (1923).

CHAPTER VIII

SMALL-POX

It will be noted that the diseases chosen for consideration, and which have been classed as Imperial, without exception can and do occur in Great Britain as well as in other parts of the Empire. This is unfortunately true of small-pox, but it might not have been so had a strong policy always been in force and had the community been free from cranks.

Jenner introduced vaccination in 1798, and had this country only been as wise and far-sighted as that benefactor of mankind, or even as some nations which have faithfully followed his teachings, and their subsequent developments, small-pox might have been excluded from our list. At the same time it would scarcely have been fair not to accord it some mention, for in many tropical countries it is difficult, owing to local conditions, to arrange for universal and effectual vaccination. Yet it is noteworthy that it is in such countries, where the ravages of the disease are well known, and justly dreaded, that vaccination is appreciated at its proper value. The irony of fate is manifest, inasmuch as the very efficiency of the Jennerian method, its success in mitigating the terrors of small-pox and wellnigh banishing it, has led foolish folk to deny it, and weak rulers to tinker with the regulations enforcing it. Indeed, in this instance it is unfamiliarity, and not familiarity, which has bred contempt. Doubtless it is difficult for the man in the street to envisage what the presence of small-pox once meant in this and other European countries, and if he holds strong views as to the liberty of the subject, it is perhaps not easy for him to recognise the perils he has escaped, thanks to the common sense of the great mass of his fellow-subjects in the past and their faith in vaccination. The pity is that the honest anti-vaccinationist, for such a person undoubtedly exists, cannot be transported back a hundred and fifty years to perambulate streets crowded with pock-marked and disfigured people and full of blind beggars.

It is also a pity that so many of the populace are swayed by the statements of the rabid anti-vaccinationist, who has closed his eyes and ears to obvious truths, and who would not

be persuaded as to the benefits of vaccination, if a whole host of small-pox victims rose from the dead.

There are, moreover, medical men who oppose vaccination either because, for various but unsound reasons, they are incapable of seeing virtue in the method or because their judgment regarding its efficacy is warped and distorted. In the history of the world there have always been such people, but fortunately they are in the minority. Still, they exist and do harm. That harm has been evident in these latter days, for this country is reaping what it has sowed, and the neglect of vaccination and the cult of the conscientious objector are being followed by outbreaks of a disease regarding the precise ætiology of which our knowledge is no doubt still defective, but regarding the prevention of which there has been no dubiety since Jenner demonstrated "the pearl upon the rose leaf," in other words, the true vaccine vesicle and its significance.

At the same time one must admit that conditions have changed since Jenner's day. He thought, naturally but erroneously, that the protection afforded by one vaccination lasted a lifetime, and the later discovery that this was not true shook the faith of many in his method. Again, so far as this country is concerned there is evidence to show that all the reduction in small-pox morbidity and mortality which has occurred since vaccination became general, has not been due to that procedure. Other factors have been at work, as will be admitted by all reasonable students of the subject, even though we may be ignorant of some of them. As we shall see later, the changed conditions of life in this country have undoubtedly played a part; even without vaccination we might have expected improvement for, like many other diseases, small-pox flourishes best where dirt or overcrowding abounds. It may, however, be safely affirmed that without vaccination the malady would never have been fully controlled. It does not come into the category of the true filth diseases.

A reasonable criticism, not of vaccination but of the method in which it is employed, demands attention and commands respect. Hence those deserve a hearing, who, in all good faith, maintain that the vaccination of infants is an unwise measure because, if not followed by revaccination, it will in process of time give rise to a population *partly* immune, some of whom may suffer from small-pox in a modified form, and thus be special sources of danger.

The chief point of these critics is that modified small-pox is not easily recognised, and thus the persons suffering from it

are apt to spread the disease.¹ There is no doubt something to be said for the arguments, provided the unvaccinated community concerned lives constantly under conditions which are entirely satisfactory from a hygienic and administrative standpoint. Even in England this cannot be predicated of all centres of population, and it is a dangerous business to permit small-pox to lay hold upon an unvaccinated community even if you have emergency vaccination to fall back upon. Moreover, let it not be forgotten that small-pox tends specially to attack children, and to withhold infantile vaccination is certainly to increase favourable pabulum for the virus, even if the risks of infection have been greatly diminished. Furthermore there is the question of protection against the severity of the disease. Small-pox in England has become much milder in type, but it is by no means invariably mild; hence it would seem a duty to ensure that by efficient infantile vaccination the whole population shall be safeguarded against the dangers of the disease in a severe form.

It may be said that efficient infantile vaccination can never now be secured in this country. Possibly not, but that is no reason for ceasing to strive for it, and let it be remembered that specious arguments against the methods of vaccination tend to discredit vaccination itself, for the man in the street is unlikely to discriminate between the scientific opponent of the method of application and the ignorant or prejudiced adversary of the vaccinating process itself.

In any case the conditions in England are specialised and the situation is complicated by the legal aspect of the controversy. Abroad the issue is clear. One simply cannot afford to defer vaccination and thereby to favour the production of highly susceptible populations. To do so would be little less than criminal.

Small-pox is a virulent communicable disease, and persons exposed to its infection are almost invariably attacked. Very few people are immune to it; hence in pre-vaccination days in England the disease spread like wildfire, just as it does now amongst unprotected and native populations. It is conveyed by contact of the sick with the sound, and more especially by means of the scabs or scales which result from the drying up of the pustules. These contain the poison, which is very tenacious and resistant. Infective clothing, articles of furniture, etc., may be factors in its spread, and there is some

¹ Even in the unvaccinated, however, small-pox may be a mild disease not easily recognisable (vide p. 257).

evidence to show that it may be transmitted by raw cotton picked by persons who have been peeling after an attack.

What is called the "striking-distance" of the disease has not been accurately determined, but it is probably considerable.

There is evidence to show that flies may transmit the virus and this can readily be understood, for these insects are attracted by the loathsome skin lesions, especially when the pustules are ruptured and discharging. A recent epidemic in Switzerland was apparently definitely traced to fly infection.

The precise nature of the small-pox virus is unknown. We cannot say whether it is bacterial or protozoal, whether it belongs to the vegetable or the animal kingdom. If it is bacterial it must be exceedingly minute and perhaps belongs to the group of organisms known as filter-passers. If it is protozoal, it has so far eluded capture, though protozoal-like bodies have been described. This gap in our knowledge is unfortunate, and it affords a handle, though a poor one, to those who oppose vaccination. It prevents the hygienist from being able to say definitely—what is almost certainly the truth—that cow-pox is only small-pox modified by passage through the cow; in other words, from establishing decisively the nature of a relationship which has an important bearing upon the vaccination question.

If, however, we do not know the virus, we are familiar, though by no means so familiar as our ancestors were, with its effects on the human body.

Small-pox is a febrile disease, and it is not surprising that it should cause fever when one remembers that it produces extensive suppuration of the skin.

In adults the malady usually begins with a rigor; in children a convulsion frequently heralds its onset. Severe frontal headache, pains in the lumbar region and vomiting are common in the early stages and, taken together, they constitute a somewhat characteristic trinity of signs. The temperature rises, often to 103° or 104° F. The pulse is quick and full, the patient restless, with flushed face and bright, clear eyes. Even thus early, in severe cases delirium may set in, more especially at night. Initial rashes are often seen, resembling in form and colour those of measles or scarlet fever, but the true eruption is not usually in evidence till the fourth day, when spots appear, first upon the forehead and then on other parts of the body, notably the rest of the face and the extremities. As the rash appears the symptoms abate somewhat and the patient feels better. On the fifth or sixth

day the papules change into blebs or vesicles. They are raised above the surface and each has a little depression at the centre. In medical parlance it is umbilicated. About the eighth day the vesicles become pustules. The little depressions disappear and the pustules present a globular aspect and assume a grayish-yellow hue, being full of pus. Each pustule is surrounded by a red halo of inflammation, and the skin between them is swollen. The temperature rises and the old symptoms recur, often in a more intense degree. The skin, especially that of the face, is painful, the eyelids become swollen and the eyes closed. The whole face is puffy and disfigured. In ordinary cases, called discrete, because the pustules are fairly separate one from the other, the temperature does not long remain elevated and improvement sets in. The pustules dry and shrink, forming scabs or scales which are shed, the temperature falls, and convalescence is established by the fourteenth or fifteenth day. The amount of pitting is very variable. It depends on the skin involvement and the severity of the attack. Even in its discrete form small-pox is a foul disease and the patient has a distinctive odour which the experienced physician may detect even in the early stages and which may render the case suspicious. Vesicles are not confined to the skin. They may occur in the mouth and throat and, if in the windpipe, may occasion hoarseness or even loss of voice.

Confluent small-pox, a terrible and loathsome disease, presents similar symptoms intensified in every respect. The papules are close together, so that later the pustules run together and the face is covered by a mask of pus. The patient lies like a log; his voice, if present, is usually husky. He is thirsty, stupefied by the intensity of the inflammation, and very often he rambles in delirium. The glands in his neck swell. His closed and swollen eyelids protrude from a bloated face; the eyes themselves may be attacked. Death frequently occurs about the tenth or eleventh day. The patient is swamped with septicity, his pulse becomes rapid and weak, he picks feebly at the bed-clothes and gives up the struggle, sometimes after a bout of diarrhoea. On the other hand he may recover, but he is usually badly scarred and may have lost his sight or his hearing:

A form of small-pox, happily rare, but which is invariably fatal and constitutes one of the most appalling diseases that attack man, is the haemorrhagic or black small-pox, as it used to be called. It need not here be described, but it gains its

name because bleedings take place into the pocks or pustules, and sometimes also from the mucous membranes. It kills quickly, the patient rarely surviving beyond the sixth day.

Such, briefly, are the symptoms of small-pox. Complications of various kinds are common, one of the worst being broncho-pneumonia.

There are abortive types and there is a mild form which occurs both in this country and abroad, and which is known as *alastrim*, *amaas*, *Kafir* or *milk-pox*. Some hold that this is a special disease, but the majority regard it as true small-pox, the virus of which has been modified in some way so that it produces only comparatively slight symptoms and is rarely fatal.

As regards the distribution of the disease it may be said that small-pox can occur, and frequently does occur, in any part of the Empire where the population is not protected by vaccination. It is true that persons who have been successfully vaccinated may acquire the disease, for no one claims that a single vaccination is a sure preventive. Revaccinated people, however, are almost invariably secure against attack, and in any case the disease is mild in vaccinated persons. It is also true that in non-vaccinated persons acquiring the disease the attack may be comparatively mild, but this is to a large extent a matter of chance, a piece of good fortune, and, therefore, does not constitute a valid argument against vaccination. The countries where small-pox is still the terrible malady it used to be in Great Britain are those where it has not been possible to make vaccination general, in other words, those which are not civilised, for vaccination is a test of civilisation.

It is interesting to note that, as Mitchell, quoting Theal, has pointed out, the Malays of Cape Town, who, as Mohammedans, had refused vaccination on religious grounds, were practically exterminated by the small-pox epidemic of 1882. The few survivors and their progeny have accepted vaccination ever since. The main and the only really effective preventive measure on a large scale is vaccination. Nowadays the vaccine lymph is derived, as a rule, from cow or buffalo-calves through which, by a process of skin inoculation, the virus of small-pox has been passed and thereby modified. This is not the place to give details of the procedure, which has now been carried to a high pitch of perfection, but it may be said that the method does away with the slight but tangible danger of introducing other diseases when vaccinating, a risk which existed when so-called arm-to-arm vaccination was

employed, that is, when lymph was obtained from vaccine vesicles on the human subject, usually a child.

If fresh, pure and tested calf-lymph be employed and reasonable care taken when vaccinating with it and after the slight operation, there is to all intents and purposes no risk of any kind.

Opponents of vaccination state that it is unnecessary, as methods of isolation and general hygiene are sufficient to prevent and control small-pox, and they allege that its partial disappearance from this and other countries is to be explained in terms of improved sanitation. Such a view is entirely fallacious. Isolation is, of course, useful, as in many other communicable diseases, and is indeed essential in the case of small-pox whenever it can be carried into effect. If only it were possible to recognise every case of small-pox promptly, and to isolate it and any contact cases for the period shown to be necessary, the disease would doubtless be prevented from spreading; but such conditions are frequently unattainable, and one missed case, let it be remembered, may be the starting-point of an epidemic. Again, though good hygienic measures undoubtedly exercise a beneficial effect, if only by lessening overcrowding and increasing bodily resistance, the occurrence of small-pox outbreaks amongst communities living under excellent hygienic conditions is proof positive, that something more is required to combat the danger.

If this is true of such populations, what is to be said regarding native communities in the tropics and subtropics, who, despite all that has been accomplished, still live for the most part under conditions which had their counterpart in the England of the Middle Ages? It will take centuries before sanitation can favourably affect the incidence and spread of small-pox in their cases, and its presence renders those attacked a danger not only to their immediate neighbours, but to Europeans who may come in contact with them, if they have not been recently vaccinated, or are unvaccinated.

There is an abominable selfishness about some of the anti-vaccinationists. They are concerned about the individual and his precious liberties, but think nothing about the mass of the population. The words *pro bono publico* mean little to them, and they do not seem to consider that those who will suffer most from their propaganda are children, unable to reason or choose for themselves. It is a remarkable fact that the practice of vaccination has altered the age incidence of small-pox. What used to be a disease of young children,

has become a malady of adults and, what is more, there is some evidence to show that when vaccination falls into desuetude small-pox again tends to attack the young. This would appear to be proved by what has happened in the Philippines.

One can still subscribe with confidence to the findings of the Royal Commission of 1896, amongst which there figured the following :—

- (a) " Vaccination removes or diminishes the liability to be attacked by small-pox.
- (b) " In the occasional cases where small-pox occurs after vaccination it is less fatal and is much milder than otherwise.
- (c) " The protection it affords is greatest in the years immediately following vaccination (about nine or ten years), and then gradually diminishes.
- (d) " Re-vaccination after ten or twelve years restores the protection for a further term of years and should then be repeated.
- (e) " The more thoroughly the vaccination is done the greater the protection it affords."

There is nothing loathsome or disgusting about vaccination, as some of its opponents aver. The method is based on the ordinary principles of immunisation, and it is strange that some who do not object to the use of anti-diphtheritic serum, which is obtained from a horse, protest against vaccine lymph, the product of the calf.

As we write, small-pox in a mild form is prevalent in Gloucester, the very county in which Jenner lived, the capital of which has of late years neglected his teaching and despised his method. It needed an outbreak of this kind to stir public opinion and to show the folly which has overtaken a considerable part of the nation. Were it not for the individual sufferers, some of them the victims of the incredulity and ignorance of others, one might almost have wished that the epidemic had been virulent, for, as has been shown again and again, public fear is often the best friend of the hygienist.

It is a pity that it should be so and that precepts and warnings are neglected at the bidding of an ignorant but loud-voiced minority. It is not only a pity but a shame, as is the fact that vessels from British ports entering those of Brazil are no longer considered to carry a guarantee of freedom from small-pox infection.

The Minister of Health has stated (June, 1923), that whereas twenty years ago 75 per cent. of the people were

vaccinated in infancy, the figure now is only 38 per cent. What wonder then that small-pox again claims victims in our midst?

Yet all this was foreseen. As Wanklyn wrote in 1922 :—

“ We stand in a position of the utmost insecurity. We may compare ourselves to watchers along a sea wall, against the top of which the waves continually break ; they frequently gain a slight entrance ; watchers hurry to the spot and repair the crack or break. But what if a wide breach be made all at once, if our vigilance, however keen, be unequal to every emergency ? We are only human, and the task that is set us, under present conditions, is to keep intact a constantly weakening wall against an always threatening sea, and once a clean breach is made, only an enormous expenditure of energy, money, and perhaps not even that, can avert a deluge from pouring over on to the low ground behind us.”

Let the words of Councilman also be recalled. It was he who said that if small-pox were permitted to become a pandemic raging over the entire world, as it certainly would if the disease were not held in check by compulsory vaccination, it would still the fears of those who dread an excess of population. Happily there is no danger of any such catastrophe even in those parts of the world owned or controlled by Great Britain, and this is specially true of tropical countries. In these small-pox is still too grim a reality for any trifling or nonsense and, in marked contrast to what goes on in England, there is considerable activity in the way of founding local vaccine institutions and doing everything possible to safeguard the native populations against the justly dreaded scourge. There are many difficulties : experts are required for the preparation of the lymph ; it is sometimes hard to obtain good vaccinifers, that is, animals for inoculation ; there is a tendency towards degeneration in the lymph strains, and the lymph is also apt to suffer in transit, for it has often to be sent hundreds of miles under trying conditions and so is liable to deteriorate. Still progress is being made and improvements are being effected. There is no need to fear small-pox, if only we adhere to the Jennerian tradition. Some day, perhaps, when the germ of the disease has been discovered, vaccination may be supplanted by a simpler and less expensive procedure, but until that day dawns vaccine lymph is our sure shield ; if only it is used as it should be used, small-pox will vanish from amongst civilised communities, and even in the wild places of the earth it will be met and mastered with the confidence begotten of security.

CHAPTER IX

TUBERCULOSIS

FEW will be found to deny the claim of tuberculosis, the "Captain of the Men of Death," as Bunyan terms it in his quaint phraseology, to be regarded as one of the Imperial Diseases. Nay, more, the majority of those who have given due consideration to the question will award it the first place among such diseases.

Tuberculosis has been designated, and rightly, the "White Scourge." As we know only too well, our race in its thirst for adventure and with the longing to extend the bounds of the British Empire, has, in establishing a footing in the lands beyond the seas, paid for its temerity a large toll in sickness and even death exacted by diseases communicated from the native; but the white man in his turn has bestowed upon these peoples a disease every whit as deadly as any he has received. As we shall see later, uncivilised communities in their native state are singularly free from the ravages of tuberculosis; but when once the germ is introduced and the seed finds ready a virgin soil, like other ill weeds it grows apace and the newly infected community is more than decimated—it may be almost exterminated—through the havoc wrought by this dread scourge.

Tuberculosis may be defined as an infection of the body by the *Bacillus tuberculosis*, and the name is derived from the fact that the lesions produced by this organism and the inflammatory reactions set up by its presence lead to the formation of minute grayish-white nodules or "tubercles." These may attain a degree of virulence sufficient to bring about local death of tissue, with subsequent softening, breaking down and, if near a surface, rupturing to form ulcers; if less severe, an inflammatory barrier arises round the focus, shutting it off from the circulation and the adjacent tissue, when it becomes an area of dead material. Yet again, there may be a condition intermediate between the active ulcerating focus and the dead imprisoned mass; the tubercle or agglomerated tubercles with the contained bacilli may be scotched but not killed, held in check merely, and ready to break out with renewed

vigour as soon as the guardian forces are reduced or their vigilance relaxed, from any cause. Such a focus is thus a constant menace.

The infinite variety of the clinical features accompanying the disease depends naturally upon the intensity of the infection, the degree of resistance which the body may be able to oppose to it, and the organ involved.

The causative organism, the tubercle bacillus, discovered by Robert Koch in 1882, is a small, straight or bent, rod-shaped body, having an average length of $1/6000$ of an inch and, when examined under the higher powers of the microscope, and after special methods of staining, the individual bacteria may show a beaded structure, the significance of which is not certain.

The organism grows very slowly outside the body and in order to obtain a culture of it for detailed study special nutritive media have to be employed. Possibly owing to its possessing a fatty covering it is capable of a considerable degree of resistance to adverse circumstances. It can remain alive in dried sputum for several months, and from the dust of living-rooms the organism can be obtained and cultivated and is still virulent and capable of setting up tuberculosis in susceptible animals. It can resist the digestive action of the gastric juice and remain alive in dead tissues which have been undergoing decomposition for many weeks. It cannot, however, withstand exposure to direct sunlight; this and certain antiseptics, such as carbolic acid in a strength of an ounce to the pint, readily destroy it.

The germ is found extensively throughout the animal kingdom and several types are described—the human, the bovine, the avian, and the piscine. The first two only are of importance from our point of view. The bovine, or cattle, type is in nearly all cases conveyed to man by the drinking of tuberculous milk, and since milk is used as the chief food in the first few years of life, we readily see why bovine tuberculosis is so much more common in children than in adults. Adolescent and adult tuberculosis, however, are associated almost entirely with the human type. The bacilli are present in all tuberculous conditions; they are few in number in chronic disease of glands, joints, or skin, there are more in actively progressing sites, but most of all in pulmonary tuberculosis or phthisis. In the sputum of phthisical patients they may be found in myriads. In some instances the bacilli may make their way into the blood stream and

be rapidly disseminated throughout every organ of the body.

Outside the body the germs are found wherever civilised human beings are gathered. It has been estimated that a patient suffering from consumption at a moderately advanced stage may throw off from one and a half to more than four billions of bacilli in every twenty-four hours. When the sputum becomes dry (as already mentioned, the bacillus can resist this drying and remain living and virulent), it is disintegrated into dust and the contained organisms are scattered far and wide. They have been found, consequently, in the sweepings of rooms, on fruit exposed for sale, in books, in the bodies of flies, on clothes, in the dust of public buildings, of the wards of hospitals, of streets, railway-carriages, and so forth. As Etienne Burnet states :—

“ On trouve comme une quintessence des poussières atmosphériques dans ces poussères fines que l'on pompe par le vide (vacuum cleaner) ; avec elles s'est déposé ce qu'il y a de plus léger dans ce que soulèvent nos semelles et l'intense circulation de nos rues, et ce que crache une population malheureusement trop insouciance.”

The hands of the consumptive are hardly ever free from contaminating bacilli.

Koch, the discoverer of the bacillus in 1882, made the pronouncement that the bovine organism was not a source of danger to man. This caused a great stir and led to several investigations. After painstaking research it has been proved that, though cattle are not very susceptible to the human type, the bovine type may, practically speaking, be quite as virulent for man as is the human. Since, however, the bovine tubercle bacillus gains entrance almost exclusively in milk by the alimentary canal, while the human more directly invades the delicate respiratory tissues, the former is less frequently associated with severe and fatal forms of human tuberculosis.

The close connection between the two types, bovine and human, as regards man is shown by the fact that in many cases the ingestion of comparatively small numbers of the bovine bacilli through drinking infected milk (and we must bear in mind that cows may secrete virulent milk although they exhibit no obvious indications of being tuberculous), leads to the production of some degree of immunity to the human type. Hence, as will be mentioned in greater detail later, we can understand the relative immunity of the adult

owing to his having been infected in childhood by bacilli of a different but allied type.

If, however, the child becomes infected by a large dose, though of the bovine type, severe and even fatal disease may ensue. Thus, to give one example, tuberculous meningitis, a most acute, distressing and agonisingly painful form of the disease, is commonly due to the bovine type, and this is very largely a disease of childhood.

It has been proved experimentally that tuberculous animals when subsequently inoculated with the bacilli are more resistant, that is, they withstand larger doses than do young, healthy, non-tuberculous animals, and, further, that at each fresh inoculation, provided the quantity is not excessive, this resistance is greatly enhanced. If, however, the dose is too large, or the intervals between the inoculations are too brief, the resistance breaks down and the disease rapidly makes headway.

The actual virulence of strains of the same type is not found to vary, that is, tubercle bacilli of the human type from India, for example, when sent home were found to agree in all essential characters and in noxious effects with the English product.

There is no evidence to show that tuberculosis is a heritable disease; some maintain that there is a condition called a "tuberculous diathesis," by which is meant that a child may be born with an undue susceptibility to the disease, his tissues having a diminished power of resisting infection.

This also is not proved; on the contrary evidence is largely against it, for experiments have shown that the offspring of tuberculous parents are neither more nor less prone to tuberculosis than are others, if both are subjected to the same conditions. It is not sufficient merely to show that the incidence of the disease is greater among the offspring of tuberculous parents than among those of the non-tuberculous; such an argument is most fallacious. The environments are different, and in order to compare such figures it would be necessary for the children of healthy parents to be born in infected houses or be placed there at birth, clearly a condition impossible of fulfilment except by mere accident. The reverse of this, which could be more readily carried out, namely, the removal of the children of tuberculous parents at birth to healthy surroundings, would not make the comparison strictly equitable because, though transference to the unborn through the maternal tissues is very rare, it is not unknown, and the

child would have been exposed to infection throughout the intra-uterine period.

The reason why the offspring of tuberculous parents more often develop the disease than do those produced by healthy stock is that the former are born in infected surroundings, and are exposed to the danger from the moment of birth ; moreover, the dose of the infecting material is likely to be large and frequently repeated.

The only important paths of entrance of the bacilli are by the alimentary and respiratory tracts. Inoculation of a wound or entry through a skin abrasion usually leads to a local lesion only, for the skin constitutes our chief tissue of defence.

Although the ingestion of bovine bacilli is common in childhood, over 90 per cent. of all cases of chronic tuberculosis are due to the human type, and the sources of infection are other patients and their careless and thoughtless habits. Those engaged in sanatorium work do not run much risk, solely because the patient, his rooms, his excreta and sputum are properly dealt with. The wards are cleaned, the sputum is received into an antiseptic and destroyed.

The human child starts life free from tuberculosis, and its fate as regards this disease lies in its mother's hands. If the mother is herself consumptive, it is obvious that the child will be exposed to large and frequently repeated tubercle infection, and will very likely die early from an acute and generalised tuberculosis. If, however, all care is taken, infection will possibly be postponed until the child is able to move about. With clean surroundings and absence of contact with consumptives the child will pick up only a few stray bacilli from some of the countless articles which come within its reach. The infant having been safeguarded, the risks become insurmountable as the years of childhood progress. Old nurses with a chronic cough will persist in tasting the baby's food to see that it is sweet or cool enough, and it has been proved that in the mouths of phthisical persons there are virulent tubercle bacilli, and, further, that in a large percentage of such cases the spoons and table utensils used by them are infected ; attendants and so-called friends will kiss the baby on the mouth or will insert their fingers to feel for coming teeth ; the mother or the nurse will feed the child with dainties from her own plate, using her own spoon ; articles well covered with the infant's saliva are dropped on to the dusty floor or in the street, are picked up and given back to the child, who again promptly returns them to its mouth. In short, the " dirty

age " when everything within reach is inserted into the mouth is the dangerous age as regards tuberculosis.

Seeing that the bacillus is resistant to adverse conditions, can retain its vitality for a long period, and is so ubiquitous, there is always the likelihood throughout life of the germ's infecting the hands and thence the mouth from articles in common use which are never disinfected. We may mention wooden toys, school-books, books in public libraries, clothing, coins, bread, cake, sweets exposed for sale, postage stamps laid face up on a probably dusty and infected counter regardless of the fact that the gum will pick up the organisms which are then licked off ; when we add that the door-knobs of public buildings, the handrails of vehicles, dust carried in from the street all may and usually do harbour tubercle bacilli, it is obvious that none of us can escape infection, at least with small doses, for long ; as a matter of fact, as the sequel will show, it is a fortunate thing that we cannot.

The maladies produced by the tubercle bacillus vary so greatly in degree and the manifestations are so protean in character that we are departing slightly from the plan, laid down at the beginning of this section, of giving a description of the symptoms of each disease, for a whole book might easily be filled with those of tuberculosis. Moreover, it is probably the misfortune of nearly every reader to know of some case of the disease with its distressing train of symptoms ; a narration of them, therefore, is unnecessary and we may profitably devote more space to other points of general interest connected with it.

Though phthisis, or consumption, is the most important of the morbid conditions set up by the tubercle bacillus, there is a large group, such as tuberculous inflammation of the glands of the neck, leading to the abscesses and unsightly scarring which one may see daily in those whom one passes in the streets ; tuberculous bone and joint diseases affecting knees, elbows, wrists, ribs, and so forth, and, when the spine is involved, leading to formation of the " hump-back." These and other less acute affections are often grouped together under the heading of " surgical tuberculosis," because they demand in most cases active surgical interference and operative treatment. They are less acutely inflammatory and more chronic in their course than is tuberculous lung infection, or phthisis, and are, in many instances, associated with a less virulent strain of organism, or with the bovine type. This latter, however, is not always

productive of milder and more chronic disease, for tuberculous meningitis or inflammation of the coverings of the brain, already casually mentioned, which is probably always fatal and runs its distressing course in two to three weeks, is, in many, perhaps most, instances associated with the bovine organism.

In spite of the prevalence of tuberculosis—with the extent of which we will shortly deal—for many hundreds of years the general consensus of opinion, medical as well as lay, was against its being infectious. Hence, until the discovery of the causative organism in 1882 it was quite natural that no connection should be recognised between tuberculous meningitis, or brain fever, in the infant, scrofula in the child, and consumption in the young adult.

No race is immune to tuberculosis. When the fact was noticed that the disease was rare among native races, this rarity was ascribed to the climate, and European consumptives were therefore advised to visit, and, if possible, reside in such places. Then, when the European had spread broadcast his bacilli, it was found that the natives among whom he resided or who came into contact with him began to suffer and to fall ready victims to the disease in its acute forms. In order still to uphold the doctrine of the non-contagiousness of tuberculosis, the explanation given was that the previous observations as to its absence had been erroneous.

As a matter of fact these observations were quite correct, but the natives in question were free from the disease because of the absence of the bacillus. This leads to the question: "Why do some persons appear to be so much more susceptible than others?" This question was debated long before the Christian era. The riddle has now been to a great extent, if not completely, solved. Many conditions were said to act as "predisposing causes" of the disease. When it was seen also that tuberculosis set up conditions rapidly running their course to a fatal issue in infants and young children, whereas the course in adults was a prolonged one, the difference was ascribed to the supposed greater power of resistance possessed by the organs when mature than when young, to the greater delicacy and permeability of the mucous membranes of children, whereas we know now that the difference was due to the fact that the adult is more resistant because he has been inoculated with small doses of the bacillus in childhood.

A few words must be written upon certain of the predisposing factors which have been referred to above.

1. *Racial Differences in Susceptibility.*—Numerous examples might be given as to the rarity of the disease among certain races and in certain districts, and some will be briefly mentioned when we speak of the prevalence of tuberculosis. We may sum up the question of race susceptibility by stating that when persons who live in countries where the disease is rare migrate—whether for industrial purposes or any other—into a country or district where it has been long established, as, for example, when natives leave their villages for towns and try to become Europeanised, they exhibit a far greater susceptibility to the disease than those who have resided in districts which have long been tuberculous. To emphasise this we may cite instances from the late war. Among the British armies in France in 1917-18 there were 2881 cases of tuberculosis in whites, of whom 165 died, that is, 5.7 per cent. of persons who had been born and brought up in a tuberculised environment. Among the Africans, who in their native surroundings were nearly free from the disease, who had been examined prior to being recruited, and who, therefore, had contracted the disease after joining the army, there were 327 cases, of whom 183 died, a case mortality of 56 per cent. The Indian divisions in France revealed an incidence of 27.4 per mille as compared with 1.1 amongst British troops; the Fijian unit, owing to the prevalence of tuberculosis, had to be repatriated. Perhaps a still more striking example is the record of Africans coming from Senegal to the Fréjus camp. Under normal native conditions there is very little tuberculosis among them, and it might therefore be inferred that they were but slightly susceptible. On the contrary, not having been previously exposed to infection, they constituted "virgin soil" for the germ and proved exceptionally liable. When first tested 4-5 per cent. gave a positive reaction, and with each year of contact with their tuberculised and less susceptible comrades the incidence and mortality among them increased alarmingly. In the three years 1916-1918 there were respectively 48, 312, and 557 deaths, and in five months of 1919 there were 298 deaths, equivalent to over 700 in the year.

It may be said that this state of things was due to the hardships of war and active service, and the idea is so widespread that it merits consideration. Medical officers who served during the war have recorded their astonishment at the remarkable endurance of the hardships of the campaign exhibited by men who had actually manifest tuberculous disease. Their constitutions seemed not to be weakened,

but, on the contrary, strengthened by a life which, hard and strenuous though it was, was spent month after month day and night in the open. In fact, a research into the records of the different armies does not reveal any trustworthy evidence that military conditions as such (apart from contact with the tuberculous) increase susceptibility to tuberculosis; it proves rather that those who break down under the stress of such service are mostly those who were grossly infected before entering upon it. In other words, as Sir William Osler wrote: "The tuberculous soldier brings his disease with him into the army." Further, the United States medical officers concluded that if those who presented themselves with *manifest* lung tuberculosis were rejected, the army would be practically free from the disease.

Examples of the rarity of tuberculosis in native races, in spite of their high susceptibility to infection, might be multiplied, but those given must suffice.

Now in civilised communities, that is, in places where tubercle bacilli are ever present, the new-born infant occupies a position analogous to that of the native introduced among European troops. The infant is "virgin soil" for the bacillus, and if the infecting dose be even moderately large, as is probable if one of the parents is tuberculous, the disease is readily acquired and runs a rapid course. Among such the mortality is very high. As time goes on, however, there is seen to be a diminishing case mortality, although in autopsies performed on persons of middle age and upwards old lesions, latent or healed tuberculous foci, points at which infection has tried to obtain a foothold but has been overcome, are not infrequently found. These infected persons have been, as we all are in towns, constantly exposed to infection, in small doses at least, and recent statistical investigations have shown that mild infections with the bovine type of bacillus, as ingested by the infant with cows' milk, may greatly assist in setting up and in increasing the general resistance to the human type to which it is afterwards exposed.

We must digress for a moment to explain how this infection, too slight to be detected by ordinary physical examination, is determined during life. The method depends on the reaction set up by inoculation with tuberculin—a product of the artificial cultivation of the *Bacillus tuberculosis*—and it is largely made use of both in veterinary and human work. In man the cutaneous test, or the cuti-reaction of von Pirquet, is most often employed, and a brief description of it must be given.

The substance used is what is known as the "Old Tuberculin" of Koch, the discoverer of the bacillus. A small area of the skin of both forearms of the person to be tested is cleansed, and a superficial scarification is made by means of a sterilised needle, just as in ordinary vaccination. On one of the spots so scarified a little of the tuberculin, made up to a strength of one in four, is smeared, the other being left untouched to serve for comparison as a control. Both are then covered with a dressing of dry sterile gauze to protect them from the air or any contamination. After twenty-four and again after forty-eight hours the places are examined. In both normal and tuberculous subjects the one left alone will heal like an ordinary surface scratch, and in normal, non-tuberculous subjects the inoculated one also; but if the person is tuberculous the inoculated area will show a distinct raised, red papule, and perhaps, in addition, small vesicles.

The rationale of the test is this: When the body is invaded by the tubercle bacilli substances are produced in the blood which are antagonistic to the germ and its poisonous products. Seeing that these "antibodies" as they are called are produced as the result of the entrance of the organisms into the system, those who are not infected will not contain them. Tuberculin itself is a liquid containing some of these poisons, and in a person who has been infected by the bacillus the blood, having been fortified by antibodies, the tissue fluids immediately attack the spot where the poison has been rubbed in, the scarified and inoculated area; the skin becomes irritated by the process, and the reaction described takes place. When this is seen, therefore, one infers that the bacilli have already entered the system of the individual. If they have not, then there is no antagonism and consequently no reaction.

It might be feared that such inoculation would act as a "provocative infection" and activate an old quiescent focus, but in the quantities used there is no such danger. On the contrary, it often appears to stimulate the body to increased formation of these immunising antibodies, and the patient shows improvement and increase of weight after inoculation.

For diagnosis of infection in cattle the tuberculin is injected beneath the skin and the result is gauged by a subsequent rise in temperature, but this we need not describe in detail.

In the new-born and in early infancy the von Pirquet test gives negative results, but with each year of age the number

which yield a positive reaction among Europeans living amid a tuberculous environment increases steadily. After the age of sixteen years the majority are positive.

We are now in a position to explain a matter which exercised the minds of workers on this subject for a long time, namely, the fact that several in a family apparently healthy during childhood, would develop tuberculosis in young adult life and die in the early twenties. In such cases there must have been intermittent reinfection from without and auto-infections (that is, a discharge of products into the system from some focus in the body) from within during later childhood and early adult life, which, under the stress of the onset of sexual development and function and later the necessity for earning wages, culminated in the breakdown of the resistance previously set up. It is clear that the result will depend upon the magnitude of the dose of bacilli affecting such "sensitised" or partially immunised individuals, whether imported from outside or extending from an internal focus, and further, that the dose from the latter will be small or great according as the foci in the tissues are few or many, and the resistance is weak or strong. Thus, where infection is much in excess of the resistance we should expect a rapid generalisation of the bacilli and a poor reaction on the part of the tissues, in fact the production of what Borel calls "*La tuberculose de l'enfant, ou du singe, ou du cobaye,*" that is, the tuberculosis of "virgin soil." Where infection is not so excessive and is more commensurate with the resistance opposed to it, we should expect the disease to remain more localised and the health under favourable circumstances to be fair; but if the body were subjected to any undue strain, or adverse circumstances, such as over-exertion, worry, illness, especially influenza, measles, or whooping-cough, the resistance would then give way and auto-inoculations would produce serious extension of the disease. If, lastly, the resistance were great and the infection small, we should then expect good general health and no tendency to further infection from within. This is the state in a vast majority of town-dwellers in civilised communities.

We cannot devote more space to this interesting aspect of the disease, but must pass on to consider briefly other predisposing causes.

2. *Age.*—This has been in part already discussed. No age is immune. The very young succumb rapidly if the infecting dose be much above the minimal, and this is likely

to be the case with tuberculous parents or in a house where there is a phthisical patient, for intimate contact would lead to large doses frequently repeated; also where children are allowed to crawl about on a dusty, bacillus-laden floor, and put every object within reach into their mouths. The almost exclusive milk diet in infancy and infection from tuberculous milk has received sufficient mention. Later, when the child attains school age, there is close contact with other children in class-rooms for the most part stuffy and ill-ventilated. Some statistics have been promulgated to show that as many as 10 per cent. of the deaths in children under the age of fifteen years are due to tuberculosis in some form.

Ordinarily, and under the favourable conditions prevailing in civilised communities, the child is attacked by bacilli which enter by various portals and reach the glands, where they are filtered off, as it were, and collect and perhaps multiply until invasion follows mere infection, that is, the number is such that the specific resistance of the body is aroused. If then the individual is protected from massive re-infecting doses, an immunity is developed which in the course of time is such that no subsequent invasion from the exterior can obtain a footing. He will then go through life without evidencing any manifest tuberculous disease, although he may be exposed again and again to infection. That is what occurs in the majority of civilised adults, but, as will have been gathered from what has been already stated, if the initial dose was large or frequently repeated, or if the individual resistance is diminished by disease or bad sanitary conditions, the entrance of the microbe can no longer be regarded as salutary, as a beneficent vaccination, but is in very deed an infection.

There are thus three classes or types of disease: the acute generalised primary tuberculosis which occurs in infancy; the more chronic, though not well localised, disease of childhood, a conglomeration of conditions including tuberculosis of bones, joints, glands, some of the viscera; and, thirdly, the shut-off, well-localised tuberculosis of the lung of the adult with the possible "pathological accident" of secondary military generalised tuberculosis which accounts, however, for a very small percentage of deaths.

Passing on to the young adult, the question of age becomes intimately connected with that of

3. *Occupation*, and
4. *Surroundings*.

Many go to work early in order to earn wages to help in the upkeep of the home. Wages for persons of this age are small, and the conditions under which they work are far from ideal, though much better now than they were a generation ago. Often the operatives have to spend hours at a stretch in ill-ventilated workshops and factories where dust accumulates. Also, when work is finished, and they are free to obtain relief in the open air, large numbers of them spend the evenings in dark, close picture-palaces, where chances of picking up further doses of tubercle bacilli are presented to them. Experiments carefully carried out have shown that infected animals (rabbits), if kept in a dark cellar, died of tuberculosis, while others equally infected, when kept in the open air, recovered. So also an infected child or youth (and the von Pirquet test shows that practically all are infected sooner or later, usually sooner) succumbs if he works in an ill-ventilated, ill-lighted and over-heated room. At this age, too, for one must not look for old heads on young shoulders, there is the incentive to get on at any cost, and, to this end, to strive regardless of the question of health, to go without food, or to snatch a hasty meal, often of unsuitable character. As dangerous labour is in some instances highly paid, many will take work which is unduly taxing and strenuous, in bad surroundings and for long hours. Hence the worst years for tuberculosis prevalence are between twenty and forty, a time when there is a striving to get a home, or to keep one going, with increasing demands from an early marriage and the coming of children, the fear of losing the post if health breaks down, the additional burden of worry and anxiety for the precarious future.

Work in dusty atmospheres is harmful according to the nature of the dust; "hard" dust, as in masons' and dry-grinders' work, is a fruitful source of tuberculous disease of the lungs; "soft" dust, as in cotton-mills, wool-factories, and similar places, is not so intrinsically harmful, but the conditions under which the employees have to work, in a close, moist atmosphere, render the environment deleterious.

5. *Climate, per se*, has probably little effect, if any at all. Many places have a reputation of freedom from tuberculosis, especially tropical countries, but this reputation really means that the territory in question is at present uninfected.

6. *Other Diseases*.—These certainly predispose, if not to tuberculosis in the first instance, at least to extension of a pre-existing condition by auto-infection. Measles and

whooping-cough are particularly associated with it in the young. Mouth-breathing due to the presence of adenoids leads to the inhalation of the bacilli in larger numbers and to the exposure of a large surface for absorption. In adult life, influenza, repeated colds, and any debilitating illness may have tuberculous extension as a sequela.

We should state, however, that many of these histories of "repeated colds" are not catarrhal in the ordinarily accepted meaning. Many of these "colds and chills" are due to the tuberculosis itself, exertion leading to a throwing into the circulation of the contents of some internal focus, with the production of a reactionary fever and chilliness.

An ounce of example is worth a pound of precept, so, to drive home what has been said about the effects of close contact and poor ventilation, we may quote a single concrete instance which has been reported by Dr. Otto May. A fishing-boat set out from the Shetlands in May with a crew of seven, all occupying one comparatively small cabin. Of these seven, five were healthy local men and two were from elsewhere; one of these two suffered from "cough and spit." Four months later one had extensive involvement of both lungs, and he died in the ensuing winter; another died in the spring with similar signs; a third developed the disease at the same time and died the following year; a fourth, "a big, powerful man," developed enlarged glands in the neck, followed by rapid phthisis in the same year; two others died of lung disease, including the original patient. In other words: seven men went to sea, one of them being consumptive; they lived together in a small cabin, probably overheated, and not cleaned because it contained too many fixtures; dried sputum would collect on the floor; when the door was opened a gust of wind would disperse the bacilli through the atmosphere of the cabin, and the inmates would thus be subjected to frequent doses of the tubercle germ, with the result narrated.

Of course, we all know that the powers of resistance of different individuals vary, not only amongst the individuals but even in the same person from time to time. A dose of bacilli therefore which might be harmless to one might have very serious consequences for another, and even for that one himself under certain conditions. In fact, a dose may be so small as to be incapable of causing any mischief to any one, or so large that the most powerful, with the most highly developed resistance, could not escape. Between

these two extremes are doses the results of which vary according to the resistance which can be offered by the individual at the moment. Hence, as stated above, child-birth, an attack of influenza, and so forth, may enable an infecting dose which under healthy conditions would be harmless to become truly dangerous, and the limits which divide the harmless from the dangerous vary with every individual and with changing circumstances.

In tropical countries yet other factors come into play, more particularly the Social Conditions and Habits of the people. In this connection we may cite the conditions under which the women live in India. Among the native women the incidence is more than double that among the men. This is due to their being secluded in harems and to their lack of opportunities for exercise. A similar state of things though to a less degree, obtained in England in the Middle Ages when women lived sedentary lives.

In India, up to the time of marriage, which takes place earlier in life than it does in England, the young spend most of their time in the open air, and tuberculosis is not so common among the girls at this period. On their marriage a complete change occurs; they are pent up, have no exercise, very little air and ventilation, and they are subjected to the exhaustion of early pregnancy and unhealthy and insanitary parturition (see *Maternity and Child Welfare*, p. 324), with dirty surroundings, and deprivation of food during the puerperium.

Secondly, the habits of natives constitute an important predisposing factor. So long as the seed is not sown there will be no crop, but once the germ is introduced the soil is ready to yield an abundant harvest. The natives, living often in mud huts, ill-ventilated and poorly lighted, to the interior of which the direct rays of the sun never gain access, are nearly all of them, Eastern and Western, dirty in their habits; they spit all over the floors, the matting, the walls, and, when they are ill, over the bed and bed-clothes, in fact anywhere. They also eat out of a common dish, drink from the same cup, pass the tobacco-pipe from hand to hand, and lie down at night in close contact on ground which is fouled by expectoration, while all crevices are carefully closed to keep out "duppies" and thieves as well as air. In short, the conditions are obviously ideal for the propagation of tuberculosis when it has been once introduced, and among a non-immunised

community, as has often occurred, the disease assumes a truly epidemic character.

We may affirm that the liability to infection exhibited by certain primitive tribes is not due to an "inherited diathesis" or tendency to the disease, but merely to absence of acquired resistance.

No race is immune. Neither climatic conditions, which for a long time were regarded as engendering tuberculosis, nor malaria, syphilis, or any other disease can be said to play any definite rôle, beyond the auxiliary effects already mentioned, in determining the incidence of tuberculosis.

Alcoholism influences indirectly by lowering the general body and tissue resistance, by replacing proper nourishment (see under Alcoholism) and leading to poverty and general unhygienic environment. The real factors at work are the same as those which operate in temperate climates, namely, bad housing conditions, overcrowding, and unhealthy employments.

We ought perhaps in fairness to mention that some have held, and still hold, the opinion that certain constitutions are more and certain others less resistant to the disease; that in a community amongst whom tuberculosis has prevailed for a long period, the process of natural selection would, by eliminating the weaker, have intensified the immunity and permitted those with greater resistance to survive and transmit this increased power by heredity, but this is only surmise; there is no real proof at present available that an increased power of acquiring resistance is, or is not, transmissible as an hereditary character.

The state of the question as regards tuberculosis amongst native races may be briefly summarised as follows: the primary cause is, in the vast majority of instances, if not in all, infection by the European, but the disease having once been thus introduced into a native community it rapidly spreads on account of their susceptibility to it, aided largely by their insanitary dwellings and their extremely dirty habits. This susceptibility may be due in part to racial inferiority in resistant power, but more to the absence of the acquired protection possessed by the European as the result of mild infection in infancy and early childhood.

The wearing of European clothes has been urged as a cause of the spread of tuberculosis in native races, and the fact cannot be overlooked that the wearing of such clothes usually connotes not only the association of the native with

the European, but also in most instances the adoption by the former of some of the habits and vices of the latter, such as alcoholic intemperance, the use of unsuitable articles of diet, and engagement in unhealthy occupations. Nevertheless this is not the whole story. The wearing of European clothing may influence the spread of the disease for the following reasons: firstly, the clothing is practically always cast-off European garments; secondly, it is not of a kind suitable for the native and his usual occupations; thirdly, it is almost invariably worn continuously without change; and lastly, no difference is made for temperature and seasonal variations; it may become soaked by perspiration, or by rain, but is left to dry on the body, and when worn threadbare it is merely covered by another unsuitable cast-off garment of a similar kind. The following is worthy of quotation in this connection:—

“A Catholic order was given the use of a small uninhabited island by the Chilian Government with a view to ‘Christianising’ the natives of Terra del Fuego there and to put an end to the ceaseless combats. So far as the Indians could be laid hold of they were transported to this island, the number sent being estimated at about 2000. Here they were put to work on a sheep farm, were compelled to wear European clothing, and were crowded into ill-ventilated huts. The result was devastation by tuberculosis. In a few years only a few dozen Indians remained alive. A priest relates that of about 200 captured Indians, 48 died of tuberculosis in a single month. The writer remarks that it is no exaggeration to say that every native Terra del Fuegan who comes permanently in contact with the whites dies of pulmonary tuberculosis, and says that the course of the tuberculosis is extraordinarily rapid. When the first certain signs of the disease are found in the lungs it may safely be assumed that the patient will die within six weeks. The total number of Indians was estimated at 5000 when white men first settled upon the island. Of these barely 300 remained in 1910. It is probable that the race will soon become extinct. Tuberculosis does not occur among the whites more frequently than in Europe, and is of the usual type. The climate, though harsh, seems to be a healthful one for Europeans. The natives say that before the whites arrived old age was the only cause of death.”—(Colonel G. E. Bushnell, M.D., *A Study in the Epidemiology of Tuberculosis*, pp. 60-61).

The distribution of tuberculosis and its effects within the Empire are very varied. We will speak of Home conditions first.

The disease is much more widespread than most people realise, in fact we should not be far wrong, nay, we should probably be perfectly correct, in saying that all town-dwellers who reach adult life have been already infected with the tubercle bacillus, though they are not necessarily victims of the disease. The same applies to the majority of country people in civilised communities. Furthermore, there is no cause for alarm in this; on the contrary, it is an excellent thing, for it implies that every civilised adult is, to some extent, those in towns to a relatively large extent, immunised against tuberculous infection from without.

When tuberculosis is spoken of people generally are apt to conjure up in their minds the advanced case of consumption, truly a pitiable sight; they forget that these cases are comparative exceptions and are examples illustrating that immunisation has failed and broken down; they forget that the majority of the inhabitants of the British Isles are never even aware that they are tuberculised.

A fairly close analogy with this would be the confusion of vaccination with small-pox; as if, knowing what a terrible disease small-pox is when unchecked by vaccination, we were to conclude that vaccination is equally terrible. The analogy is not quite complete, as no analogy ever is, for the immunity which occurs in tuberculosis is a continuously produced immunity resulting from the continually repeated infection, whereas vaccination against small-pox needs to be performed intermittently. The former is therefore more potent than the latter, because of its constant renewal; the weak link in the chain is that this constant infection demands a constant active resistance which, if the infecting dose be large, may be overpowered, so that the individual, though immunised against tuberculosis, may nevertheless die of it.

Statistics show that between 73,000 and 75,000 persons die of tuberculosis every year in Great Britain and Ireland, and that 750,000 (and this is a low estimate) are incapacitated by it. These figures refer to the disease in all its grosser forms, and do not include the minor varieties such as skin affections (*lupus vulgaris*), ulceration of the eyes, and so forth, which are too numerous for estimation.

Of the figures given, however, the large majority is made up by cases of chronic phthisis (consumption), which constitutes 63 per cent.; acute phthisis accounts for another 7 per cent., tuberculous meningitis for 11 per cent., abdominal tuberculosis for 8 per cent., disseminated disease for a like

number, 1 per cent. are joint cases, and the remainder is made up by various special forms.

About sixty years ago the death-rate from this disease was recorded officially as 3300 per million of the population, in 1910 it was 1500; that is, in fifty years the death-rate had been reduced by more than half, and there had been an average yearly decline of 36 per million. If this rate of diminution were to be maintained tuberculosis should be a rare disease in twenty or thirty years. Figures drawn up from unofficial sources show similar results. In 1922 there were 42,000 deaths in England and Wales from tuberculosis, constituting one-eleventh of the total deaths from all causes. Consumption, the pulmonary variety of the disease, attacks mostly those between the ages of twenty and thirty-five years, setting up a chronic, lingering illness lasting perhaps as long as three or four years, and during most of that time the afflicted are totally unable to work. This is sad enough, but if we look back there is cause for congratulation. Seventy-five years ago the disease was nearly four times as prevalent, and, as has been stated above, during fifty years the deaths have been reduced by more than 50 per cent., while since the beginning of this century they have dropped a third.

No obvious single fact is discoverable to account for this change. The optimistic will point to the year 1882, when the bacillus was discovered, because the finding of a cause is half-way towards the suggestion of a remedy, but the decline began prior to this date; others will aver that the introduction of sanatorium treatment in 1900 is responsible, but this, excellent measure though it is acknowledged to be, has not obviously affected the rate of the diminution; yet again others have suggested that the virulence of the bacillus has diminished, or that the resistance of the inhabitants has become greater, both purely hypothetical suggestions which may be true, but for which there is no evidence.

We are therefore driven to ascribe the improvement to generalities such as an increase in the national prosperity, the demolition of insanitary property and replacement by better housing conditions, to amelioration of the general social state, more careful supervision and improvement in the milk supply, and, lastly and especially, increasing isolation and segregation of consumptive individuals. The cause of the decline in the death-rate is, however, still somewhat obscure. We know that tuberculosis was more prevalent at the beginning of the nineteenth century than it was in the middle; we

know also that its incidence began to fall prior to the inauguration of the sanitary measures carried out at various times between 1866 and 1894; in other words its prevalence has been diminishing steadily (we speak of Great Britain) since the early part of last century, during which period poverty has been decreasing. Necessarily associated with poverty is underfeeding and it is axiomatic that increase in wealth results in better feeding, while malnutrition and underfeeding have for centuries been held accountable as influences predisposing to tuberculosis. While the tuberculosis rate has been declining, figures show that the amount of butter and milk consumed per head has increased, and though this increase in itself may have been operative in causing the fall in the tuberculosis rate, it must not be forgotten that such decline may be due to a greater degree or extent of immunisation resulting from the increased ingestion of milk containing bovine tubercle bacilli.

Though the actual incidence is less, the disease when it does take hold is not less formidable than it was in the earlier part of last century. The expectation of life of tuberculous patients, those with definite physical signs indicating that the resisting power, or immunisation, has been overcome, is not very long. Thirty-two per cent. die within a year of the appearance of recognised symptoms; 54 per cent. within two years, 74 per cent. within three years, 82 per cent. within four years, 85 per cent. within five years, while 50 per cent. of those whose disease is supposed to have been arrested die within five years. This, of course, does not mean all who give a positive von Pirquet reaction, but those who have definite recognisable signs and by taking every care were declared to have got the upper hand and stayed the destructive process.

Although the tuberculosis mortality rate has fallen during the last half-century, sharing thus in the fall of the general death-rate, strange to say, this is almost entirely due to improvement in the rate for adults; there has been little, if any, diminution in the mortality rate of tuberculosis in children, and we must therefore infer that the results are ascribable to increased immunisation of adults.

Turning next to the tropics: tuberculosis, though very widespread, is not universal; there are certain parts of the globe where the disease is rare or even absent, and this is found on examination to be due to the relative isolation of the communities in question. In the continent of Africa, for example, there are considerable tracts where the disease

is practically unknown, such as parts of the interior of the Transvaal and on the Upper Zambesi, among isolated tribes in the Kameruns, such as the native Dualas, also among the Sudanese in their natural surroundings. Before the Pacific Islands were linked up with the outside world, in the Hawaiian Islands some seventy years ago, tuberculosis was very rare, if not unknown. When, however, communication was established and the European came into contact with the non-tuberculated and susceptible native, the ravages of the disease became extensive. In India, as we shall shortly see in more detail, tuberculosis was far from common before European civilisation was pressed upon the natives, but it gained ground rapidly as communication improved, when schools were established and industrialism increased.

The tuberculosis rate among the Bantu Highlanders is only 1.05 per cent., among Duala children 2.3 per cent., and among the adults 6.6 per cent., whereas of the Hausas and the Hottentots, who for many years have been in contact with Arabs and Europeans, the number yielding a positive reaction to the tuberculin test is 18 per cent. among children, and over 40 per cent. in adults.

As an excellent example to show that the lower rate is due merely to diminished opportunities for infection and not to natural resistance we may cite the Sudanese soldiers recruited for the Egyptian Army from the Nilotic tribes where tuberculosis is rare; they fell easy victims to the disease when they came into contact with the infected, whereas the Fellaheen of the Delta, who have had tuberculosis in their midst since dynastic times, proved much more resistant.

Calmette, who has investigated the prevalence of this disease among uncivilised tribes, found that only imported cases were present in the Bahr-el-Ghazal. In parts of the hinterland of the Kameruns he discovered none; nearer civilisation, as in Natal and Madagascar, tuberculosis prevailed. In the cities of Northern Africa the incidence is about the same as in Europe, nevertheless in the Arab tribes there is little or none. As a concrete instance he records that in a school at Kilwa 23 per cent. of the negro, 100 per cent. of the Indian, and 20 per cent. of the Arab children were positive, whereas among the adults in the same locality at that time only 17 per cent. of the negroes and 25 per cent. of the Indians were infected. These figures will be seen to approach those of a modern civilised town such as Paris, Vienna, Prague, where the tuberculin test is reacted to positively by one

out of every five children under the age of two years, by more than half of those of five years, by 90 per cent. of those up to fifteen years, and by 97 per cent. of the adults.

Owing to the bad hygienic conditions under which the native in the tropics lives, he is likely, if opportunity for infection is afforded, to receive a large initial dose, and—as has been abundantly shown earlier in this section—when such an entirely unprotected human organism, no matter what the age, is infected by a large number of bacilli, the result is a generalised and usually very acute disease. It starts with fatigue and shortness of breath, and is accompanied by pallor, rapid pulse, perhaps a sub-normal temperature, but more usually by fever, the lungs rapidly becoming consolidated, the progress of emaciation being noticeable almost from day to day, the patient sinking into a septic “typhoid” state with muttering delirium, and dying with signs of heart failure from the overwhelming intensity of the poison.

Space will not permit of our speaking in detail of the prevalence and characters of tuberculosis in all the various parts of the Empire overseas, nor are statistics available from all, but in some it constitutes a problem of very great importance and must be considered. Before discussing it, however, it will be well to clear the ground by giving a brief summary of a few chief points to save useless repetition.

In the tropics, then, we find that both the extent of the prevalence and also the type of tuberculosis vary within wide limits. In some parts, such as tropical Asia, Samoa, Hawaii, and the Philippines, the disease prevails, but the mortality rate is not much in excess of that in England at the present time, and moreover it corresponds fairly with the general death-rate for the respective communities, as in all places where rational attempts are made to improve general sanitation. In such places surgical tuberculosis is comparatively common, and when the pulmonary form exists it is mostly of the less acute and even chronic variety. We note, as bearing out what has been already said, that the inhabitants in these places have been now for some time in contact with civilised races, and have therefore been exposed to infection with tubercle bacilli.

On the other hand, in certain parts of Africa and in some of the Pacific Islands the disease is uncommon, and here, although the morbidity is low, the mortality rate is exceedingly high; chronic forms of the disease are rare indeed, and

the bacillus, when it gains a foothold, sets up an acute illness which rapidly courses to a fatal termination. That is to say, having been comparatively isolated from the outside world, these races or communities have remained free from infection, or relatively so, whereas those referred to in the preceding paragraph owing to their long contact with infection and the small doses contracted in childhood have developed a degree of immunity. In these non-immune peoples, consequently, when opportunity for infection does occur, the disease runs riot and may extend like an epidemic. Thus, Queensland, on account of its favourable climate, has been for some time a resort for consumptives. The Polynesians, introduced for labour purposes, having been previously free from the disease and having had no opportunity of establishing any immunity, though they constitute only 2 per cent. of the population, account for 22 per cent. of the tuberculosis mortality.

Those who have read Robert Louis Stevenson's book, *In the South Seas*, will recall the following striking passage :—

"The Marquesan race is perhaps the handsomest extant. Six feet is about the middle height of males; they are strongly muscled, free from fat, swift in action, graceful in repose. To judge by the eye there is no race more viable; yet death reaps them with both hands. . . . The tribe of Hapaa is said to have numbered some four hundred when the small-pox came and reduced them by one-fourth. Six months later a woman developed tubercular consumption. The disease spread like a fire about the valley, and in less than a year two survivors, a man and a woman, fled from that new-created solitude. . . . When I first heard this story the date staggered me; but I am now inclined to think it possible. Early in the year of my visit, for example, or late the year before, a first case of phthisis appeared in a household of seventeen persons, and by the month of August, when the tale was told me, one soul survived, and that was a boy who had been absent at his schooling."

Calmette also mentions the fact that of 2000 natives of the Marquesas introduced by an Englishman into Lima, 1500 died of tuberculosis in less than eighteen months.

One last instance culled from nearer home and mentioned by Bushnell. In 1803 and 1810 the government imported 3000 to 4000 negroes from Mozambique to Ceylon. In 1820 there were only 440 remaining, and this number included the male descendants of those originally introduced.

The law of Römer is amply warranted: "Where tuberculosis is a rare disease the cases that occur will be acute and fatal. Where the disease is common the type will be chronic and relatively benign. In other words, contact with tuberculosis affords a certain protection against it."

And now a few words as to the prevalence of tuberculosis in some of the most important parts of the Empire, stating, where we can assign them, the causes of such prevalence. We may fitly begin with

India.—Tuberculosis has been recognised in India for ages, for references to its presence and to its treatment are to be found in the classical works of *Charaka* and *Susruta* in the pre-Buddhist period.

Among more than 8000 autopsies in India less than 3 per cent. had any tuberculous lesions; we may say therefore that, generally speaking, the natives do not suffer from the earlier infections in minor degree which lead in Europe to the prodection of immunity, and, as one would naturally expect, the disease, when it does occur, runs a more rapid course; as a matter of fact, records tend to bear this out, the majority of those infected dying within a year of the first recognisable symptoms.

The bovine type of tuberculosis is very rarely seen; not only do the native cattle seem to be more resistant to infection than cattle in England, but where milk is consumed this is usually from buffaloes and goats, animals which present a still greater degree of resistance. Moreover, the milk is not, as a rule, drunk unboiled. In some countries, Burma, for example, if anything is used to supplement breast-feeding, the infants are given rice-water or some such product.

It is worthy of note that the rarity of bovine tuberculosis in Bombay coexists with a very acute type of disease in man, and it is thought by many that there is some causal connection between these phenomena. The children, being unprotected, soon succumb if taken into the more populous areas; thus orphans brought to the urban asylums from districts devastated by famine die of tuberculosis in large numbers.

Statistics prove that the degree of infection amongst natives is in ratio to the proximity and the numbers of Europeans immigrating, and varies according to the social and economic factors which prolong the contact with the latter. Thus, wandering tribes of tent-dwellers and small groups of persons living in scattered huts are less affected than those living a sedentary life in village communities,

while the disease attains its maximum incidence in sedentary and massed communities living in more or less permanent contact with Europeans. A total of 12-14 per cent. of the deaths in India are due to tuberculosis.

As regards climate and prevalence the hill plateaux have the lowest morbidity rate, but the dwellers in these parts fall ready victims when they immigrate into the industrial towns. The highest incidence is found along the coast, in the plains and valleys and in the industrial centres.

Surgical tuberculosis was formerly thought to be very uncommon, but careful observation has shown that it is far less so than has been recorded by earlier authorities. It is rare where the pulmonary disease is frequent (for example, the Malabar Coast), but in places where the von Pirquet reaction is positive in large proportion among children (that is, in those who have been exposed to small doses of the bacilli in infancy and who have consequently developed a certain degree of immunity) enlarged tuberculous glands of the neck are more common, and in adolescent life when those so affected migrate to the cities and become infected with more massive doses pulmonary disease, or phthisis, supervenes.

The chief factors concerned in the causation of tuberculosis in India are social in nature. Wherever a race or a society develops or unwisely alters its ancestral customs, the morbidity and mortality figures are found to rise.

Modern civilisation has effected a great upheaval in the social, industrial, and economic life of the Indian people; the increased facilities for travel, the opening up of large manufacturing centres, the establishment of schools, factories, and workshops all over the country have swelled the town population at the expense of that of the villages, brought about the evils of overcrowding, expensive rents, dear food, slums, with their attendant insanitation, and greatly increased the incidence of tuberculosis. In some parts the congestion has become so great that in Cawnpore a few years ago there were 563 persons to the acre, and 76 per cent. of all the families in Bombay were found to be dwelling in single-room tenements. The mortality rates in Bombay and Calcutta are higher, considerably higher, than in Glasgow, Birmingham, or Manchester. "The yearly mortality from tuberculosis," says a writer who has carefully studied the disease on the spot, "cannot be less than 900,000 to a million; that is, India loses annually a number equal to the population of Bombay or Calcutta."

Besides the overcrowding, poverty, and bad sanitation, the primitive mode of living and the habits of the people, however harmless in their native condition in the absence of tuberculosis, now foster the spread of the disease—the mud houses with mud floors in so many Indian villages, harbouring dust and dirt ; the system by which big families live together ; the purdah custom relegating women to the dark and dingy parts of the house ; the early marriages, sapping the vitality of thousands of the young ; the pernicious habit of indiscriminate spitting—these are some of the chief factors in lowering the natural resistance of the people and paving the way for tuberculous invasion, while the heat and dust and the debilitating effects of malaria aggravate the evils of the disease.

The women show an even higher incidence rate than do the men, owing to their seclusion and to the insufficiency of light and air in the zenanas. In Calcutta, for example, hundreds of young mothers die of tuberculosis owing to child-birth, and twice as many women as men succumb to the disease.

The Second Sanitary Conference of India, held in 1912, showed quite definitely that within a few years there had been an alarming increase in the figures recording the incidence of tuberculosis, part, but only part of the increase, being due to better diagnosis and to notification of cases as a result. It was proved that the increase occurred particularly in the more densely populated areas, that it was extending step by step from the towns to the adjacent villages, and that, too, proportionately to the ease of communication. Those who came from tubercle-free regions were proved to have the greatest susceptibility, and when the infected returned to their homes they formed fresh foci there, and the disease spread rapidly in parts where it had formerly been rare or even absent.

In Burma many of the factors mentioned are not operative as in other parts of India ; for instance, early marriages and seclusion of the women ; also the houses are better ventilated and the general sanitary sense appears to be more developed. As a result the disease is considerably less prevalent in that province.

Africa.—Fifty years ago tuberculosis was not common in South Africa. Even among Europeans it was rare until in more recent years this country acquired the reputation of possessing a curative climate for the disease, and numbers of consumptives migrated thither.

Many of the conditions described in India find their counterpart in Africa, and to restate in detail the remarks made upon them would be but vain repetition. Those parts first to become European settlements were the first to show prevalence of tuberculosis, so that in some places the incidence among the "mixed" and "coloured" races is now fully five times that among the Europeans. Further, the native population which pressed into the cities owing to the demand for labour due to the spread of industrialism, have fallen victims in large numbers. Like the natives of Indian villages, the Kafirs, the Basutos, and others lived under conditions favourable to the spread of tuberculosis; the soil was ready, but the seed had not been sown; communication with the outside world was very limited, and they lived very largely in the open. Now, they crowd into airless and often insanitary compounds, work in the mines in a dusty atmosphere laden with siliceous particles, mix freely with infection and contract the disease. Beaufort West, which formerly was regarded as free from the scourge, was chosen on account of this freedom and of its climatic conditions as a health resort for incipient and even late phthisical patients. Now consumption is rife there, and has attacked so vigorously the native and mixed population in Cape Colony that it is extending throughout the town among these people, even while it is diminishing among the Europeans.

As the League of Nations Report on Tuberculosis aptly states: "In the towns the natives have changed their habits which approximate to those of the Europeans, and this, together with Alcoholism, doubtless accounts for the greater diffusion of the disease." We must remember, too, that we are dealing with people highly susceptible from absence of previous contact with the bacillus.

Tuberculosis amongst the mine workers is too important a matter to be dismissed merely with the brief reference above. Silicosis—a more or less generalised fibrotic state of the lungs due to the inhalation of hard, flinty particles—is set up through working in a mine atmosphere, but though both Europeans and natives suffer from this condition, greater numbers of the former exhibit it uncomplicated, while the latter develop tuberculosis as well, and of so rapid a character that it kills before the fibrotic stage of the silicosis becomes very general. Thus in the Report for the year 1921 of the Miners' Phthisis Board of South Africa, the following instructive figures are given:—

Europeans with silicosis alone	19
Natives	4
Europeans and tuberculosis	23
Natives	170

Many of the afflicted natives do not stay and die at the mines; they are repatriated, and on their return to their native villages, the insanitary kraals inhabited by a highly susceptible population, they constitute a very grave danger to their neighbours and associates.

“ The gathering together into the trammels of industrial work large detachments of susceptible persons and repatriating to their native homes the infected victims of the disease, which is essentially one that spreads from man to man under home conditions is not a sound business proposition. On humanitarian grounds the most vicious circle that was ever created in any country.”

As regards other parts of Africa we have no systematic records comparable to what has been published for the French African colonies, but a certain amount of information is obtainable from annual reports sent in from various British colonies and protectorates, though this information is mostly in general terms, no concrete figures being presented. The main facts, however, are there and will help to impress upon the reader points to which reference has already been made. Thus in Gambia the natives, living amidst unhygienic conditions with marked lack of ventilation, form a highly receptive soil in which the seed took firm root and grew rapidly when the European once introduced the disease. Further the ground-nut industry produces an irritating dust which prepares the way for and assists the action of the organism on the lungs.

In Sierra Leone the majority of the cases are pulmonary; Kru boys engage themselves on the ships and proceed to England, there become infected, and on return act as foci for dissemination. Seeing that prior to this the disease was rare, the natives prove very susceptible, the infection is usually virulent and soon terminates fatally.

The same applies to the natives of the Gold Coast, where there has been of late years an increase both in incidence and in the mortality rates.

In Nigeria, again, the number of cases and of deaths has

progressed for the four years of which statistics have been obtained :—

1918	..	..	140 cases	34 deaths
1919	..	..	188 "	43 "
1920	..	..	257 "	50 "
1921	..	..	273 "	62 "

The report for Nyasaland states that pulmonary tuberculosis is of comparative rarity among the natives of the protectorate, but that it is being gradually introduced by those returning home infected from work in the South African mines.

The Sudan has already been mentioned incidentally, and a word or two more will suffice. Observation has shown that the primitive Sudanese in their natural environments are almost free from tuberculosis. This is borne out by Anderson, who states that amongst the Nyams-Nyams and Gours of the Bahr-el-Ghazal Province, he did not meet with one suspicious case, and Calmette found none but imported cases in the same locality.

In *Hong Kong* tuberculosis is very rife, and, as a result of prolonged research carried out by one of the present authors, the prevalence is shown to be due in part to the exclusion of light and air from the dwellings of the Chinese, but in far greater measure to the pernicious habit of spitting. The housing conditions are such as greatly to facilitate the transmission of the bacillus from man to man and still more from adults to children. Ingestion of tuberculous milk has no influence, for the Chinese children do not drink milk. The disease is due to environmental conditions and the spitting habit, the prevalence being closely connected with social and economic factors—overcrowding and slums, poverty, insanitation, and squalor. The overcrowding of the poor in Hong Kong is great, and the rooms in which they live are dark, the sunlight could rarely penetrate even were it permitted to do so ; these rooms are still further darkened by gratings and shutters over such windows as exist. The population is large and the space for their accommodation relatively small ; floor space is quite inadequate, window space much less than it should be ; the windows, moreover, are often kept closed and are made of opaque and coloured glass, so that penetration of light is reduced to a minimum.

Dr. W. W. Pearse, Medical Officer of Health for Hong

Kong, states in his paper, "Sanitary Progress in Hong Kong" :—

"The area being limited and the Chinese population being large and constantly increasing, building sites have become very expensive so that the streets inhabited by the poorer Chinese are narrow and the houses fronting on them high; in some the height is five times the width of the street. The floors are supported by Chinese fir poles, and these, if longer than fifteen feet, are not of sufficient strength to act as joists, and therefore the width of the storeys is practically limited to fifteen feet or even less. To provide more accommodation the floor space is increased by extension in depth out of all proportion to the width, so that a Chinese house becomes a pile of veritable tunnels, fifteen feet wide by perhaps sixty feet long, divided into rooms, all but the end ones having no windows or means of ventilation."

Without going into the question of other contributory causes one would expect a high mortality rate from tuberculosis under such conditions, and in fact among children it is high, but after childhood, though the morbidity is great, the mortality is unexpectedly low owing to this acquired immunisation in those who outlive childhood. It will be interesting to note what effect the influx of Chinese, still further increasing the overcrowding, owing to the recent troubles in Canton will have on the incidence and mortality from tuberculosis in Hong Kong.

West Indies.—The latest actual figures which we have been able to obtain, though not very recent, will suffice to show how prevalent tuberculosis was some ten years ago, and there is every reason to think that the numbers are higher still at the present day. Thus, in the quinquennium 1909-1913, in Turk's Island 14.4 per cent. of the total deaths (4 per mille of the population) were due to this disease; in Grenada 5.72 per cent. for the general rate, and, for the town of St. George, nearly double this, namely, 10.4 per cent.; in St. John's, Antigua, 6.13 per cent.

Dr. Geoghegan of Turk's Island quotes the following two instances as indicative of the virulence the disease may assume :—

"1. In one family a girl is dying (of tuberculosis), her mother is now affected, amongst the family a young man, her uncle, died of the disease; the father, his sisters, and the sister's fiancé are tuberculous.

"2. A young man died of it, then followed, first, the father, then a brother, then a sister, all in the same house, and leaving a sister from the house and a brother living elsewhere, both tuberculous."

In Trinidad there is considerable overcrowding, and an investigation into the circumstances of tuberculous patients revealed the fact that in the houses of 534 such there were 1506 inmates, of whom 1104 were under thirty years of age. Even the people in fairly good circumstances stop all ventilation at night, and of the 1104 mentioned, 730 slept in the same bedroom as the patient, and in 383 instances actually shared a bed with him.

The excessive heat and high humidity would seem also to have some predisposing effect, for there is an increased tendency to the disease even among Europeans, although they do not share in the negro susceptibility to tuberculous infection.

In Port of Spain records show that in a series of five years this disease yielded a death-rate of more than 5 per 1000 inhabitants.

Lastly, a few words on the *Islands of the Pacific*. We have not been able to obtain actual figures on which we could rely, but, for instance, in the Ellice Islands, tuberculosis is said to be rife. Tuberculous glands of the neck, many of them with discharging sinuses, are quite common amongst older children and adolescents, while phthisis prevails among the adults. Sometimes an entire family is infected. Amongst these people dissemination is aided by the custom of several persons sleeping in close contact under one mosquito-net; by the native habit of spitting nearly everywhere, but for preference on the floor and under the mats of the houses; by the tendency of the natives to sit about in garments saturated with moisture, these garments being cast-off European clothes; lastly, by the fact that flies are permitted to cluster round tuberculous sores and sinuses and convey the bacilli broadcast.

And now as to the measures to be taken to control the scourge. Paradoxical though it may seem, these may be directed towards two diametrically opposed ends.

The Utopian would naturally say that the be-all and the end-all is to protect the individual against infection from the very beginning and aim at the production of a tubercle-free people. On the other hand, tuberculosis is with us, in our

very midst, and town-dwellers at least come into contact with the bacillus every day; we live in a tuberculous world, and modern civilisation brings inevitably with it a tubercularisation. What would be the results of our escaping all dangers of early infection? From the statements already made it will be obvious that we should lose the benefits of early tubercularisation, and be in the position of the highly susceptible tropical races before the advent among them of Europeans. Then when the time came for us to go out into the world, we should be in danger, daily, almost hourly, of developing an acutely fatal infection. Hygienists have done their best for twenty and more years past to lessen tuberculous infection; if their apparent aims to avoid all early infection, or to postpone all infection as long as possible, were accomplished, what would be the result? Their efforts have been successful in diminishing the amount of the infecting dose and perhaps the frequency of it, and so far they have done well; but they have not lessened to any material extent the morbidity of the disease, and, in our opinion, this is a fortunate thing. Granted that in the abstract diminution of the incidence is a desideratum, nevertheless tubercle bacilli are with us and reduction of morbidity means diminished tubercularisation, so that after a delusive, mid-cyclonic lull we should have epidemic, acutely fatal tuberculosis taking the place of the previous comparatively mild general type of disease.

Of course it is a mere truism to say that if we could control the source of infection, if we could isolate all cases and prevent the spitting habit and ensure tubercle-free milk and butter, we should get rid of the disease.

On the other hand, seeing that the bacillus, under the present conditions of things, cannot be eliminated from civilised races, the better end to keep in view would be to render, if possible, every one actively immune to the organism. As we have pointed out, practically every adult shows that he has developed some degree of immunity, and if the present high percentage could be raised to 100 and the degree of resistance be increased, the results would be all that could be desired. Infants, the susceptible and unimmunised, who die of acute generalised military tuberculosis, serve no useful purpose whatever as regards assisting tubercularisation of the individuals of the race; the consumptive, inimical indeed for the uninfected, is nevertheless most valuable at the present time, because he unwittingly provides for that

immunisation which keeps our race from perishing, as it would, if thrust unprepared into the maelstrom of tuberculous infection.

Good hygiene, very desirable and of the utmost importance in lowering the general death-rate and that of tuberculosis with the rest, is less valuable in this respect than would be an optimum tuberculisatation.

Nature, wasteful in all her methods, shows herself prodigal in this, for even at the present day there are some 100 deaths a day in Great Britain alone from tuberculosis, and if only we imitate her methods as we have done in the prevention of enteric fever and small-pox, and as we undoubtedly shall be able to do in the future against tuberculosis, we shall succeed, by thoroughly scientific methods of inoculation with carefully standardised dosage, in preventing the useless sacrifice of lives. It has even been suggested that children should be immunised, as many are at present naturally, by systematically allowing them to drink infected cows' milk, instead of aiming at a "pure milk supply." This is not so retrograde a step as it sounds, if (the "if" is a big one) it were possible to regulate the dosage. At present this is not under control, and it may therefore be excessive; hence, as has been pointed out earlier, the giving of tuberculous milk is fraught with danger, not so much from the fact of its containing tubercle bacilli, but because the number of these organisms is unknown, uncontrolled, and often excessive. It is quite possible that in the future a sterile milk may be deliberately inoculated with standardised and carefully controlled doses of the bacilli and the fluid used as a vaccine for oral administration.

The problem of tuberculosis prevention, as Professor Lyle Cummins has pointed out, is not by any means the simple matter that many people, medical as well as lay, would have us believe it to be; it is not summed up under the few headings of "fresh air," "clean milk," "better housing," "sunlight." Cases of the disease occur amongst those who spend their lives in the open; severe tuberculosis is seen in countries where cows' milk is not drunk; the well-to-do, with magnificent houses, yield their quota to the tale of victims; in the tropics, lands of perpetual sunshine, as we have seen, tuberculosis often appears in its most virulent forms.

The problem, far from being simple, is a many-sided one, because the sources and modes of infection are various. We swallow bovine tubercle bacilli in infected milk and

possibly in infected meat, though the last must be an exceedingly rare source, because of the care with which meat inspection is carried out in the first place, and, in the second, because meat is seldom eaten uncooked.

Milk, the chief food of infants and young children, is not the pure, delicious drink we all of us hope, some of us imagine, and few of us pretend that it is. Its collection and distribution are not above reproach. All the measures which have been suggested and put into use have failed to give us anything like a pure milk supply. Here, as is so often the case in preventive medicine, we know what is needed but we cannot attain our desire.

The human type of tubercle bacillus is inhaled in the dust-laden air of towns, railways, and so forth, as already detailed. The main source is the sputum and the cough-spray of the consumptive. We all know perfectly well that phthisical subjects constitute a danger, but again we are not able to act upon such knowledge as we would like.

With pneumonic plague, which is spread in a similar way, the disease is so acute and the patient so ill that he cannot rise and mix with his fellows, and we can deal with it. But with tuberculosis we have to do with a disease which may persist for years, which does not prevent the victim from working, from marrying, from having children. The fact of a person's reacting positively to the von Pirquet test does not warrant us in preventing him from exercising his profession, from travelling in public vehicles, or on ships, from mixing with healthy comrades, however much we may try by supervision and education to render him as little noxious as possible.

Many of the infections are never even diagnosed; many of those known to be infected cannot be properly controlled. Who would support the man's family if the bread-winner were to be isolated, perhaps for months and even years, because he had tuberculous mischief in his lungs? Hospitals and sanatoria take many, but far more remain outside.

Susceptibility, not among different races merely, but among individuals of a race, varies widely; children are more susceptible than adults, rural populations than urban, the reason being the relative absence of previous contact with the organism. All this has to be taken into consideration; yet further, certain trades are associated with a high mortality from tuberculosis, and faulty conditions of living may result in the lighting up of an infection which, under happier circumstances, would have remained latent. Measures of control,

therefore, must vary with these many factors. The risks to the child, apart from the milk infection, are to be found at home amongst the parents and relatives ; if the latter are tuberculous, and particularly if in an advanced stage, the patients should be separated from the child, or the child removed to a place of greater safety.

At the same time, and even more as age advances, general hygiene, clean houses, sunlight, open windows, fresh air, good food, and so forth, all need seeing to ; later still, the character of the work the subject is to undertake and the means of minimising the dangers of industrial labour require constant attention. Adults in towns are already infected, and according to the degree of this, so is the resistance offered to further infection from without ; in fact, in many this resistance is so great that such further infection is practically impossible ; the danger then is from massive auto-infections, from the subject's own foci, and the aim must be to avoid anything which might tend to activate a latent lesion—all the insanitary conditions mentioned above, bad housing, poor food, indoor work in dark and damp rooms. Yet, in spite of this knowledge, the man may have to remain at work in such surroundings far beyond the time when he is fit to do it, in order to keep the wolf from the door. The source of the evil in such a case is the bad working conditions, and, in fact, in civilised towns and centres of industry tuberculosis is largely a *social* disease.

The question of control need not detain us long. The main indications will have been grasped from what has been already stated. The chief fundamental principles are the same whether at home or abroad, the modifications are matters of local concern.

In England we may say that from the point of view of control the following are the chief requirements:—

Firstly, to deal with the 75,000 who constitute the annual death-rate of the disease ; secondly, to enable the less seriously affected to overcome their disease ; thirdly, to attend to the conditions of life and living with a view to preventing the malady from obtaining a foothold. This last is largely connected with the first two, and the solution of this part of the problem would be simple if these could be adequately dealt with.

Provision must therefore be made for advanced cases of the disease. "The number of beds required for this," says the Departmental Committee in its 1912 Report, "is

problematical," but we shall not be far wrong if we take it that half as many beds would be required as there are cases dying during the year, that is, between 30,000 and 40,000 beds. Instead of this there are, apart from the Poor Law accommodation, less than 1000. Dr. Crocket suggests that small nursing homes should be equipped in or near the cities to which the patients belong, each capable of taking some twenty-five to thirty patients; they would thus be still among friends and able to maintain their local interests. As tuberculosis is an infective disease, many could be accommodated in annexes to fever hospitals and infirmaries, or in sanatoria with a less rigorous régime than is customary for early cases who need disciplining and teaching how to live when they return to their own homes. It would also be a good thing if there were certain institutions where refractory patients might be detained. Under present conditions if a patient is quarrelsome or dishonest, alcoholic, or objectionable in any way, all that can be done is to send him out; by this means his relatives and his friends (if he has any) are penalised and his surroundings become infected.

For those who are less advanced, but who, if not looked after, will pass into the category just considered, sanatoria might be provided which could be so managed as to give the patients an interest in life, with carefully regulated work for those capable of performing it. A stay in such a place should not be too brief; the present practice of remaining a few months, more usually a few weeks, is of very little service; the patients return to their homes, and a large majority of them soon cease to carry out the lessons they were taught in the sanatorium.

At first sanatoria were boomed as the great "cure" for consumption, but the extent of prevalence of the disease was under-estimated, also its duration, and the time and cost necessary for the successful treatment of cases. Careful working out of ways and means has shown that at least two years (in some instances three, or more), are needed to arrest satisfactorily by sanatorium methods a definite but favourable case of the disease, and the cost is about £500. This is clearly prohibitive for any but the well-to-do, and, even if it could be compassed, the probabilities are that the patient would refuse to stay. Arrangements, nevertheless, might be made whereby if things were at a standstill, or the patient were becoming bored by the monotony, he could be transferred to another locality for a time. This, however, is at present out of the

question. Under existing conditions, whereby patients can remain at the sanatorium only for a comparatively brief period, they can be taught how to live under the most favourable environment, or to make the best of the surroundings amid which they have to live and maintain themselves, and on their return they can instruct by example and by precept the non-tuberculous as well as the infected.

The primary functions of sanatoria should therefore be educational and preventive, the treatment of cases secondary ; or better still, the two might be combined—education *by means of* the treatment and instruction of patients. Hitherto attention has been too largely confined to the point of view of the obviously tuberculous and their contacts. Education, however, must begin earlier than this if the best results are to be obtained. By talks, by lectures, by readings, by pictures, hygienic instruction can be begun at school, so that every child becomes a missionary and every home a sanatorium.

Civic and Legislative Control of Tuberculosis may be summed up shortly as comprised under the following :—

1. Compulsory Notification. This gives us the facts upon which to work, telling us the prevalence and character of the disease in its more general aspects ; and by a multiplication of individual points it gives us information as to the age and sex prevalence, the occupation and district in which the disease is rife, and affords the foundation on which future action may be based.

2. Inspection of Infected Premises and Persons. By these means we find out how long the patient has been ill, what was the probable source of his infection, whether he himself is likely to be the cause of further cases at his home, at his place of work, at the school, if a child. Other information can also be obtained, which may prove useful to a health officer for reasons other than the disease in question only ; such, for instance, as the nature of the dwelling, the number of the inhabitants, the economic condition of the family, the state of the locality. From these can be determined measures for dealing with the individual, his residence, the district, or even the community in general.

3. Protection of the Patient's Family, not merely by isolation of the patient himself, but by impressing upon him and his associates the principles of sanitation, measures of cleanliness, personal and in the home, the benefits of fresh air, ventilation, sunlight, and the importance of disinfection. If the

patient will not carry out the advice given, measures should be taken to protect the others by arranging for his removal, even, if need be, for compulsory detention.

4. In an early stage, when the individual is able to continue at work, advice should be given as to the most suitable, or least harmful, employment, both from his own point of view and that of his associates, avoiding, for example, work in a dusty and irritating atmosphere for his own sake; the occupations of teacher, cook, and so forth, for the sake of others.

5. Education, from the point of view of the individual, would start from the time of reception of the first notification. Health-leaflets, both of a general and of a special nature might be left at the home, personal instruction given as to the disposal of sputa and excreta, care in washing hands, and so on; disinfection of bedding, rooms, and clothing undertaken during the illness and after the death or removal of the patient.

Preventive work, if it is to be of any real value and lead to lasting results, must make provision for maintaining the dependents of the tuberculous individual while he is undergoing treatment. Under present conditions one hears almost daily the plaint of a patient making good progress that he must leave the sanatorium because he cannot afford to remain longer. No man can rest mentally or physically—and freedom from worry is just as important as physical rest—while he feels that his wife and children are suffering from a poverty which he thinks he could alleviate. Consequently he returns to his work far too soon, and in 99 per cent. of cases to the occupation in which he contracted his disease.

It follows from this that the after-care of tuberculous persons is all-important if lasting benefit is to result from sanatorium treatment and training.

The above measures are all of a nature applicable to the infected individual and his environment. Measures of a general nature will be in constant action, such as:—

1. Attention to general sanitary administration, among which food and milk inspection would receive special care. Under the present regulations for food inspection and the destruction of unsound food, infection by meat is very unlikely to arise; milk is more dangerous, but very little need be added to what has already been said on this point. In many cases the milk itself is of fairly good quality, but subsequent treatment renders it harmful; this is especially the case in

the tropics, where it may be exposed to dust, where a dirty dipper is used for ladling it out of the can, where a deficit is compensated for by the addition of water from a running gutter.

There is a lacuna in the regulations in England which needs to be filled up. If a sample of a suspected milk is taken for analysis, bacterially and otherwise, in the interval between the sampling and the termination of the examination the suspected cow may be sold out of the district, and the animal may no longer be traceable. It is a well-known fact that large numbers, some state thousands, of milch cows known to be tuberculous have in recent years evaded active public health authorities.

2. Building Laws framed on sound public health principles, allowing for destruction of slum property. Not that such property is a direct cause of tuberculosis, but by giving rise to dirt, overcrowding, poor feeding, domestic unhappiness, worry and anxiety it acts as a potent predisposing and subsidiary cause.

3. Town-Planning Laws, apart from Building Laws, to arrange for the provision of open spaces, recreation grounds, gardens, parks, etc.

4. Regular, systematic, and thorough inspection of schools and school-children, factories and workshops.

5. General education of the people on lines similar to, but broader than those embodied in the special instruction to the patient at his home.

6. Improvement of the conditions of labour may perhaps receive mention here, but one hardly knows whether to include it under legal measures, for these conditions are regulated by the Trade Unions, which appear to be above the law.

Before we pass to the last section of this chapter, the control of tuberculosis in the tropics, it will be both instructive and interesting to indicate briefly how the authorities in England have grappled with the problem.

In spite of the general recognition of tuberculosis as an infectious disease, the establishment of its notification was a slow and gradual process, extending over five or six years. In 1907 the Local Government Board (now merged in the Ministry of Health) tentatively began to encourage the voluntary notification of cases of phthisis or pulmonary tuberculosis, and in the following year notification was made compulsory for all such cases coming under the care of Poor Law medical officers. This was extended three years later by the Public Health (Tuberculosis in Hospitals) Regulations, 1911, to all cases

treated in public institutions, but still applying to pulmonary tuberculosis only, and later in the same year notification of all cases of the pulmonary forms of the disease was rendered compulsory. Finally, in 1912, a consolidation of the previous orders took place with an amplification by which all forms of tuberculosis became compulsorily notifiable.

When some idea had thus been obtained of the vastness of the problem, schemes were devised for dealing with tuberculous patients, at first the insured persons, later the uninsured also, and in 1919 the question passed from the control of the Local Government Board to that of the Ministry of Health, and there was set up a special department to deal solely with this disease, Dr. F. J. H. Coutts being at the head. By this means were co-ordinated, as it were, the various branches of public medicine and Poor Law administration concerned in this complex problem. The sub-joined table, taken from a paper read before the Tuberculosis Society in January, 1924, by A. S. MacNalty, is inserted for two reasons: firstly, to demonstrate how greatly the scheme for dealing with the disease has grown in recent years, and, secondly, to enable the reader, by referring to the figures given already (p. 279), to see how much remains to be done. It shows the number, character, and accommodation of the residential institutions approved by the Ministry up to March 31st, 1923.

RESIDENTIAL INSTITUTIONS.

Sanatoria and Hospitals.	Number of Institutions provided by		Number of Beds provided by	
	Local Authorities	Voluntary Bodies	Local Authorities	Voluntary Bodies
1. Sanatoria (including consumption hospitals)	129	69	8,221	5,075
2. Isolation hospitals (including small-pox hospitals) having beds for tuberculosis	54	—	2,287	—
3. General hospitals	1	127	20	473
4. Children's institutions	17	44	998	2,312
	201	240	11,526	7,860

The problem to be dealt with has long been recognised as a combined medical and sociological one. Patients leave the sanatoria with lesions partly healed and their general condition improved, but it is obvious that they cannot compete with the healthy in the labour market. Their impaired physique cannot support the strain of modern industrial life, and they descend, in most cases rapidly, in the economic scale. Hence the need for the After-care Committee, the training colleges, and the village settlements where patients can do work under proper medical supervision, work graded to each individual's capacity and under such conditions that at the first sign of a breakdown he will again be admitted promptly to hospital for further treatment, and with a mind free from the burden of anxiety as to what is happening to those dependent upon him.

No more need be said upon this point at present; the Ministry of Health is closely watching the development of these experiments, for they have not yet passed beyond the experimental stage.

There is no doubt, however, that in the solution of this two-fold problem—medical and sociological—will be found the secret of success in dealing with this all-important question.

Very little remains to be said relative to the control of tuberculosis in the tropics, beyond what is stated above. The main principles are the same, though local modifications are often called for.

The European races, as has been shown, are strongly immunised against external infection by tubercularisation in early life, so that our sense of the seriousness of this disease as a communicable malady is dulled. We have, however, indicated how terrible may be its ravages when introduced into virgin soil among an unprotected community.

We must be careful, therefore, for the sake of the native, in recommending consumptives to reside abroad. What appears harmless to us as an immunised community is a grave danger to unprotected individuals, and, now that we are fully aware of it, to recommend a measure which might indirectly cause wide-spread disease and death, to introduce an infective disease into a district previously exempt, becomes an inexcusable crime.

We lay stress on this because recently Kenya Colony has been boomed as a good health resort for tuberculous patients. On the plateau of Kaikipia the climate is healthy and

invigorating, life in the open is possible nearly all the year round, the rainfall is low, there is abundant sunshine, the shade temperature is about 70° F. at midday, and the mornings and evenings are cool and fresh. "Several of the settlers who came out here suffering from tuberculosis are now strong and healthy and able to work hard," writes the promoter of the scheme. One would like to know the rate of increase of tuberculosis among the susceptible and unimmunised natives during the next few years.

Several of the colonies are well to the fore in the care of patients and in regulations for tuberculosis prevention.

Thus, in certain of the West Indies there are societies devoted to its prevention and treatment; in British Guiana and Grenada there are special hospitals, but these are given up almost entirely to advanced cases, isolating them and easing their last days.

The chances of recovery or improvement depend largely upon the early diagnosis of the disease. In tropical tuberculosis cough is not, as at home, an early symptom; fever is often for a long time the only complaint, and, in fact, many cases are for a considerable period regarded as suffering from malaria, whence perhaps arose the belief that "many cases of tuberculosis date from an attack of malaria."

In the West Indies, therefore, recommendations have been made for the establishment in each island of centres for consultation, with the aim of procuring early diagnosis. At the Tuberculosis Conference for the West Indies held at Trinidad in 1913, compulsory notification was recommended for that colony together with an extension of the Dispensary system with free consultation and treatment, the provision of a proper home for open cases, and a limited amount of sanatorium accommodation for the treatment and education of those in an early stage. But most of this was rendered nugatory because the overcrowding of the poor was left unrelieved. As a reader of a paper at the Congress stated: "It is futile to grapple with the tuberculosis problem in Trinidad unless steps are taken to let light and air into the incubators of the disease, the numbers of which are legion in this town alone (Port of Spain)."

On the Gold Coast the following preventive measures are in force, but they are often evaded, or are not universally imposed:—

Firstly, notification; an excellent measure, but the rule

applies only to Government Medical Officers ; secondly, certain cases are isolated either in an infectious diseases hospital or on the veranda of a general native hospital ; thirdly, infected premises have to be disinfected ; fourthly, leaflets of warning and instruction are issued and distributed, written in the vernacular ; lastly, cases are followed up and examinations carried out to discover early cases, and segregation is suggested, but if any object to this no further means of persuasion are attempted.

The initial outlay and the current expenses for all this preventive work are by no means light, and it is not easy to persuade the executive that money spent in sanitation is the best of investments and yields the largest return. The present proportional expenditure for tuberculosis at home amounts to just over 2 per cent. of the total spent on Public Health Services, and seeing that this disease is responsible for about 10 per cent. of total deaths this amount cannot be regarded as erring on the side of excess. We may end this subject by quoting what is done at two places abroad, not under British control, one in which the measures are all repressive and legislative, the other showing what has been carried out where no reasonable expense was spared.

Legislative measures in the Belgian Congo :—

1. Prevention of the entry into the Colony of all "infective" cases of tuberculosis.
2. Obligatory Notification of all cases :
 - (a) In the non-indigenous, medical supervision, compulsory measures of prophylaxis, and in the case of "infective" tuberculosis an obligation to quit the colony within a maximum period of six months.
 - (b) In the indigenous, visits and compulsory notification, medical supervision, directions as to place of residence and measures of prophylaxis, together with registration of cases and a statement as to type and progress.
3. Inspection and control of flocks and herds and regulation of the sale of products liable to be contaminated.

As regards the Dwelling :—

- (a) To cleanse by means of antiseptic solutions and aeration the dwelling, which should not be a material part of a structure occupied by others ; to allow no one except wife or husband to sleep in

the same room ; to fumigate daily by means of substances supplied for the purpose by the medical officers.

- (b) Clothing and linen to be sterilised by boiling in a 5 per cent. solution of copper sulphate.
- (c) Secretions and excretions to be received in special receptacles containing 2 per cent. carbolic acid or 1 per thousand corrosive sublimate or lysol ; to burn all dressings.
- (d) All plates, dishes, and eating utensils to be disinfected by boiling water.

If the sick person does not carefully observe these prophylactic measures, or when the medical officer considers his state demands it, he may be ordered into hospital.

All this may be theoretically very good and appears to leave no loophole, but the measures savour too much of compulsion to be acceptable to the British mind. As the wise old schoolmaster said, " There are two ways of imparting knowledge—by the head and by the tail—I prefer the former." So, in our opinion, leading is better than driving, enlightenment is not only preferable to repression, but is really the only method likely to be crowned with success.

Contrast the above with the following brief account of the anti-tuberculosis campaign as carried out at Porto Rico, because it affords a good example of what can be attained without an excessive expenditure, but at the same time without stint.

A sanatorium was established on elevated land overlooking the sea at the outskirts of San Juan. Structures were erected with a wooden roof supported on a rectangular wooden frame, with a concrete flooring. The framework was covered with impermeable paper, and each " tent " accommodates two patients. All round were tarred awnings which could be raised or lowered at will by means of pulleys. For advanced cases a larger " hospital " of similar structure was erected and contained twelve beds.

The administration building was separate and comprised a consulting room, a special room for the treatment of throat and laryngeal cases, a laboratory, drug store, linen store, etc. Another building, also separate, accommodated the Superintendent and Nursing Staff, and in a third were the kitchens, pantry, wash-houses, incubator and disinfecting chamber.

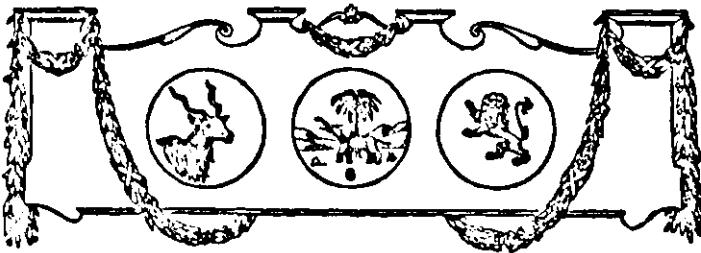
Every patient leaving the sanatorium, on return to his home, was a missionary proclaiming to his neighbours the

benefits he had received, his health and strength regained, and the means by which these ends had been attained.

In various parts of the island Dispensaries were set up at which free consultations and assistance were given. At each of them was a trained nurse, whose duty it was not only to attend to the patients applying for treatment, but also to visit them in their houses, encourage them, and impress upon them the importance of following out the sanitary rules and instructions which had been given them. These nurses were very carefully selected, and only those capable of exerting tact and personal influence for enforcing compliance with orders were retained.

Finally, to complete the system, a Ladies' Committee was formed which inquired into the domestic aspect of affairs, and provided needy patients with necessary funds for maintenance and clothing.

Some such lines might with advantage be followed in many parts of the British tropics, where tuberculosis has established itself and where it is essential to combat it by every available means.



Badges of
Somaliland. Gambia. East Africa Protectorate.

CHAPTER X

VENEREAL DISEASES

IN a book of this kind it would not have been easy a few years ago to deal with a group of maladies which, until recently, were not considered fit subjects for discussion in polite society, and about which the laity, generally speaking, had hazy or antiquated views. Yet in any account of diseases having an Imperial significance the venereal complaints must be included, for in nearly every part of the world they exercise a profound effect upon the welfare of communities and, in addition to causing wide-spread misery and sorrow, greatly diminish efficiency and are not an infrequent cause of permanent invaliding and of death.

Happily a marked change has come about in the way they are viewed, partly because the war increased their incidence and brought home to the masses as nothing else could have done the extreme seriousness of the situation. Hence the public has become so enlightened and information is now so readily accessible and widely diffused that the difficulty is not one of handling the subject, but of gauging the extent to which it should be ventilated in a volume of this nature. We have decided that no lengthy exposition is necessary, for the venereal diseases are no longer looked upon as the pariahs of medicine.

There are at least four of them—syphilis, gonorrhœa, soft sore and venereal granuloma. The last-named is almost wholly confined to tropical regions and to native races, and we do not propose to deal with it or with soft sore, for neither is of sufficient importance to merit special consideration. It is otherwise with syphilis and gonorrhœa. In the case of both these diseases, however, it seems advisable to depart from the method we have been following. It is scarcely necessary to describe their symptoms or even to deal at any length with their ætiology. It appears better to discuss the problems they present from the standpoint of the public health and, even so, having regard to limitations of space, to concentrate on certain special aspects which they present.

Still it may be said that syphilis is due to an organism

belonging to the class known as spirochætes, which are generally regarded as occupying a half-way position between the vegetable bacteria and the animal protozoa, while gonorrhœa is caused by a true bacterium of the coccal or spherical type. There is good reason to believe that syphilis was originally a tropical disease confined to the New World, and that one of the results of the great discovery of Christopher Columbus was to introduce this terrible malady into Europe. March 4th, 1493, the date on which the Spaniards, some of whom had acquired infection in Hispaniola, landed at Lisbon, may, as one writer says, rightly be regarded as "dies Europæ fatalis." The curious can pursue the historical argument if they so desire in a paper entitled "The Fourth of March: A Doleful Anniversary," which appeared under the initials G.M.C., in the *British Medical Journal* for March 3rd, 1923. The origin of gonorrhœa is lost in the mists of antiquity. It is a legacy from the ancients.

Although usually acquired through sexual congress, both diseases may be spread by other means, and this is one of the saddest features connected with them. Moreover, in syphilis the infection may be transmitted hereditarily and the stock be thus poisoned at its very source.

Syphilis is a killing disease, though it usually takes long to kill; gonorrhœa is not, but, so far as the production of disability goes, the late results of untreated gonorrhœa are so serious that there is little to choose between them. Both may be causes of sterility and both are enemies of the human race.

Gonorrhœa is the more widely spread throughout the Empire, for there are a few portions of the latter where syphilis is practically unknown. As an example take Fiji, where it is believed by some that the universal prevalence of yaws, another spirochætal disease, has bestowed upon the populace an immunity as regards syphilis. This is doubtful, but the fact remains that the Fijians do not suffer from syphilis. Amongst most native communities in the tropics, however, both diseases are exceedingly common. In certain regions syphilis occurs in its most virulent forms, exhibiting those terrible and disfiguring features which characterised some of its outbursts in the Middle Ages. On the other hand, amongst the less civilised peoples its late effects upon the nervous system are not so marked and, so far as we know, it is not such a deadly disease. We speak advisedly, for we are not fully conversant with the results of the disease on the health of native communities in parts of Africa and elsewhere. The

dire mischief which it has wrought in Uganda is, however, a matter of history and has already been considered.

In the case of the white races syphilis has been aptly described by Sir James Crichton-Browne as the hidden hand in pathology, for to its insidious taint are to be traced many cases of aneurysm, angina pectoris, organic heart disease, cerebral hæmorrhage, softening of the brain, Bright's disease and epilepsy, which outwardly have no apparent connection with it. Sir William Osler placed syphilis as third in the list of the great killing diseases, but the American Social Hygiene Association accords it the premier position and Marshall, a distinguished English syphilologist, is inclined to agree, at least if, as he says, we recognise the fact that syphilis is a predisposing cause of tuberculosis.

Apart from actual death and disease, syphilis is undoubtedly responsible for much of the "queer mentality" which so many people display, for some of the cranks and oddities amongst mankind, because its subtle poison damages the higher nerve centres in an intangible manner, but one which betrays itself in what the Scotch would call "orra" ways.

In wellnigh every part of the Empire and in every field of imperial activity the venereal diseases, aided by alcoholism, have played a rôle, the importance of which has long been recognised by the medical profession, though it was not until comparatively recently that the Faculty as a whole woke up to the necessity of publicly declaring war on these maladies, and combating them upon the large scale.

We have spoken of the importance of the rôle of these diseases, but it is essential to view the situation in a reasonable manner. Nothing is to be gained by exaggeration, and it must be remembered that while venereal diseases claim numerous victims amongst all grades of society they are, broadly speaking, urban maladies. It is where people congregate, where the prostitute, professional or otherwise, is busy, where temptations abound, where there is a lessening of restraint and a loosening of home ties that the *Spirochæta pallidum*¹ and the gonococcus find a hunting-ground and the pabulum for their existence. Rural areas both at home and abroad are comparatively free. As the *British Medical Journal* in an editorial on the Report of the Royal Commission on Venereal Diseases wisely remarked in 1916: "At the worst computation there is no ground for the alarmist reports of certain crude 'social reformers,' who have filled our ears

¹ The generally accepted term for the spirochæte of syphilis.

with cries that in this people 'from the sole of the foot even unto the crown of the head, there is no soundness . . . but wounds and bruises and putrefying sores.' "

As we have indicated, the public health aspect of the venereal diseases was more or less ignored in the United Kingdom until a few years ago, although in 1909 D. N. H. Robson, in a paper entitled "Sexual Disease and its Medical Prevention," described and advocated practical methods of prophylaxis corresponding to those now in vogue. He was, however, like a voice crying in the wilderness and was indeed, to some extent, ostracised. Scant attention was paid to him, and even after a Royal Commission reported in 1916 the situation was not much farther advanced, for many of its recommendations had already been urged on the State by commissions and committees. Moreover, while there was much that was of value in them, such as the advocacy of facilities for prompt and reliable diagnosis and treatment and a plea for the better education of the medical profession and of the public, particularly of the youth of the country, the Commission would not face the crux of the matter—personal prevention. Mother Grundy cast her shadow over its deliberations and in her blighting shade its fruit, good though it was, did not come to full maturity. It took a great world war to awaken the nation to a sense of the danger which threatened it, and the duties it owed to those who served it. Once again fear was the stimulus to drastic action, for the inefficiency and losses brought about by the prevalence of venereal infection amongst home and colonial troops was such as to cause the greatest disquietude.

Still, there had been useful legislation prior to the war, as, for example, the Police Bill for the suppression of those vile *souleneurs*, who act as middlemen, living on the earnings of wretched women and sometimes even marrying them for this purpose. This Bill also dealt with the iniquitous white slave traffic.

There came into existence two bodies, the Society for the Prevention of Venereal Disease and the National Council for Combating Venereal Diseases, which, as their titles indicate, had the same laudable object in view. Unfortunately they differed over one point, the only real difference between them, and that was the subject of practical prevention, or rather the method by which practical personal prevention should be carried out. As the result of isolated efforts in the Navy and Army the Society subscribed to the opinion voiced by Colonel

Harrison, now Special Medical Officer for Venereal Diseases at the Ministry of Health, when he said :—

“ From the medical point of view the prevention of venereal disease is as easy as its cure is difficult. . . . I am sure that our greatest hope of exterminating venereal disease lies in the breaking of the chain at the male end, where the handicap is distinctly in our favour.

“ The gonococcus and the *Spirochæta pallida* are the most delicate organisms in existence ; they are planted on an exposed situation and easily liable to removal by urination or ordinary ablution. When natural agencies are assisted by the prompt application of antiseptics, it can easily be proved that the chances of infection may be reduced to an infinitesimal amount. Promptitude is vitally necessary to success, and if the man is situated where he cannot obtain skilled assistance, he should have the means of self-disinfection with him.”

The National Council, on the other hand, objected to self-disinfection on moral grounds, and also because it believed that such a practice would tend to increase promiscuous sexual intercourse and *pari passu* venereal disease. As Corbett-Smith tersely puts it, the one body said, “ Carry the stuff on you and disinfect yourself,” the other, “ Go and get disinfected at the public charge as soon as possible after you have run a risk.” He adds : “ There can be no doubt which should prove the more effective, for ‘ time is of the essence of the contract.’ ”

The controversy was long and at times acrimonious, but it served the useful purpose of ventilating the whole subject, focusing public opinion upon it, and gradually enlightening the masses. It led finally to a semi-public investigation by the National Birth Rate Commission, some members of which were in favour of self-disinfection while others vehemently opposed it. Yet this Commission after full inquiry unanimously agreed that :—

“ It is the recognised duty of every citizen who indulges in promiscuous sexual intercourse, and thereby exposes himself or herself to the risk of infection, to obtain and apply efficient disinfectants personally, immediately after intercourse, and in the event of the development of disease to seek medical advice at the earliest opportunity.”

This finding was a notable step in advance, for it *approved* the principle of self-disinfection. Then the real question at

issue became the supply of disinfectants. There was a very natural feeling against any line of policy which savoured of handing the youth of the country packets of disinfectants, telling them to be continent if possible, but explaining that the contents of the packet would, if properly used, practically abolish the risk of infection if Nature proved too strong for them. It was felt by many that such a course incited to immorality or at least tended to weaken self-control. The situation was, however, well summed up by A. Mearns Fraser, the Medical Officer of Health of Portsmouth, early in 1921, when he wrote :—

“ So far as I have been able to understand it the charge of encouraging immorality rests upon two arguments, one, that by removing the fear of disease we are eliminating a deterrent to promiscuous sexual intercourse, and the other, that the carrying by an individual of a substance which will protect him from venereal disease acts as a powerful ‘suggestion’ towards acts of immorality.

“ In the first place I do not think it can be maintained that the fear of contracting venereal disease plays any material part in preventing men from indulging in sexual intercourse. Its most probable effect is to cause men to avoid professional prostitutes, and to go instead with women whom they think will be free from disease (evidence shows that 60 per cent. of cases of venereal disease are contracted from ‘amateurs,’ and not from professionals). The great prevalence of venereal disease is in itself evidence that the fear of it is not a deterrent, for instance, the Royal Commission on Venereal Diseases recorded its considered opinion that not less than 10 per cent. of the population of large cities had been infected with syphilis, and syphilis is not nearly so prevalent as the other venereal disease, gonorrhœa. It is surely nonsense then in the face of such evidence to maintain that the fear of venereal disease has exercised any appreciable part in the prevention of promiscuous sexual intercourse.

“ In the second place, the accusation that by instructing a man how to guard against venereal diseases, we are inducing him to become immoral, appears to me to be based upon a false conception of morality. True morality is of a man’s inner conscience, his ideals ; it is with him a matter of conviction, and no moral man will be induced to commit immoral acts simply because he becomes possessed with the knowledge that such acts can be committed without fear of contracting disease. The only ground on which the charge of inducing immorality can with any appearance of truth be brought is on the hypothesis

—and it is only hypothesis—that there are men desirous of committing immoral acts, but who are deterred from doing so for fear of disease. Such men, however, are already immoral at heart, and no great moral distinction can be drawn between a man who desires to commit an immoral act, but is deterred from doing so by the fear of disease, and the man who is not so deterred. Let me quote a passage from the Sermon on the Mount. Christ said: ‘Ye have heard that it was said by them of old time, Thou shalt not commit adultery; but I say unto you, that whosoever looketh on a woman to lust after her hath committed adultery with her already in his heart.’ Our Lord placed in the same category both the man who only desired to commit adultery and the man who actually did so. I venture to say, therefore, that even supposing some men, having acquired a knowledge of how to avoid disease, should proceed to commit acts of immorality which they had previously refrained from owing to a fear of disease, yet the moral standard of these men has not been lowered.

“And further, the argument that if a man is told that venereal diseases can be prevented by the use of potassium permanganate, he will carry this with him and it will act as a constant suggestion to immorality is equally untenable. I admit that if the policy of indiscriminately issuing ready made-up packets of disinfectants were adopted, there might be some grounds for objection; we, however, propose nothing of the sort. We only suggest that advice should be given as to the steps to be taken to avoid venereal disease after exposure to infection, and if a man straight-way provides himself with the means of protection, it is evidence that he is already a man of immoral tendency, for he would not take the trouble to provide himself with the disinfectant unless he had the intention of indulging in illicit intercourse. Any suggestion to immorality that may occur is due to the man himself and cannot be blamed on the advice given.”

He was but voicing the opinion of some of the most eminent medical men of the day, amongst them Sir William Osler, whose nobility of character and whose sound judgment have never been doubted.

The latest, or perhaps we should say the penultimate, development in the way of inquiries was the appointment of a Committee with Lord Trevethin as Chairman. Its Report has recently been issued and states that there is no evidence of facts in support of the view that any system of disinfection would tend to increase the number of exposures and so raise the disease rate. Doubtless as the result of this conclusion, the Report makes the important recommendation that

properly qualified chemists should be permitted to sell *ad hoc* disinfectants provided these are sold in a form approved and with instructions for use approved by some competent authority. The Committee does not think that any system of general compulsory notification of venereal disease would be desirable and in this respect undoubtedly endorses the view taken by the best-informed medical opinion in this country.

It also considers that the provision of public disinfecting stations, save at special places such as seaport towns, would be a waste of money and inferior in value to self-disinfection, education of the public, and improvement in the general conditions of life.

The Society for the Prevention of Venereal Disease and the National Council for Combating Venereal Diseases have declared that they approve and support the whole of the Trevethin Report, a most welcome pronouncement, and they have now agreed to form a joint committee to see how its provisions can best be carried into effect.

All this would have gladdened the brave heart of Sir William Osler could he have lived to see it, for it was in 1917 that he wrote :—

“ To many the venereal situation looks dark and hopeless. It is not. For the first time in history the outlook is bright, despite the fact of an inevitable increase of cases during and after the war. Three things have happened to justify this hope.

“ The public is at least awake to the necessity of an educational campaign, in which the appalling dangers of the disease shall be brought home plainly. Other means than those heretofore must be brought to bear in a full and free enlightenment upon the subject. Such literature as Corbett-Smith's *Problems of the Nations*, and the various publications of the National Council are having an enormous influence. That the preaching of chastity appears a ghastly failure, in the face of the record of 800,000 fresh cases annually in this Christian kingdom (Melville White's estimate), is no reason why the earnest appeal for personal purity should not take the first place in the educational campaign. Where the Apostles had to confess defeat their successors need not feel discouraged, and had they not laboured so hard for so long the percentage of the pocked in the community might have been doubled. The reproach is not upon Christianity, but upon earthen vessels too frail to hold it. Venereal disease has been called a bi-sexual problem. Patrol beside St. Martin's Church at this hour and you would be inclined to deny it; but remember for the aggressive harlotage that still disgraces our streets man

is primarily responsible. The blame, but not always the burden, is upon him. The pity of it is that the strong offences' cross is borne, not always by the offender, how much soever he may sorrow, but by innocent women and children who form more than one-half of the victims.

"That the State has at last intervened is another ground for hope. In the matter of health you may trust the people. Once get democracy to realise that it is badly diseased, and it displays a Job-like regard for its skin. Has not Tammany, a very synonym for corruption, given New York City the most progressive, up-to-date system of sanitation in the world? You will have gathered . . . that I am a strong advocate of strong central control in these matters. My inspiration does not come from Hegel or his bastard modern disciples, but from the fountain-head, the great teacher who tried in vain to bring the Athenians back to 'thoughts of order, to disinterestedness in their functions, to that self-concentration of soul in one's own part, that loyal concession of their proper parts to others on which such order depends.' Plato tells us 'States are as the men are; they grow out of human characters.' How chastened has been the strong Ionian element in British life! The war has brought to the individual a Dorian realisation of duty never before witnessed. All that a man hath—all that he holds dearest are drawn into a new ideal of service to the State. It will not be so hard after this schooling to accept an ever-increasing control of the disease by a Ministry of Health, with notification and compulsory treatment.

"Most hopeful of all is the changed heart of the people. At last the sinner is to receive Christian treatment. Above the mantelpiece of his library hung what the founder of my old school, the Rev. W. A. Johnson (Trinity College School, near Toronto), used to call the Magna Charta of humanity. In the centre of the most dramatic scene in the Gospels stood the woman taken in adultery. About her thronged the Scribes and Pharisees, with eyes turned from her to the Christ, stooping as he wrote with his finger on the ground the watch-words of the New Dispensation—'He that is without sin among you, let him first cast a stone at her.' I should like to see a copy of this picture in every one of the new clinics in testimony that we have at last reached the full meaning of the priceless message, 'Neither do I condemn thee; go, sin no more.'

"Fighting in this spirit, the soldiers of our 'New Model' will put up an irresistible barrage against the most formidable enemy of the race—an enemy entrenched behind the strongest of human passions, and the deepest of social prejudices."

As in all sanitary endeavour, however, education must

take a foremost place, and hence it is gratifying to note that so much has been done and is being done both in the United Kingdom and abroad, to spread the gospel of hygiene in relation to these social maladies. From the imperial point of view the most important work in this connection was that carried out by the National Council for Combating Venereal Diseases in 1920-21. With the sanction and assistance of the Colonial Office, the Foreign Office and the Treasury, educational commissions were dispatched to certain of the Crown Colonies and Protectorates. One went to Gibraltar and Malta, another to the West Indies, and a third to the Far East.

Their terms of reference were, briefly, as follows :—

1. To confer with the Colonial Government authorities as to the steps—both preventive and curative—that can be taken locally to reduce the incidence of venereal diseases.

2. To discuss with the local authorities the preparation of constructive proposals with reference to the possibilities of developing a complete scheme for prevention and treatment in each colony.

3. To report to the National Council the local conditions as to venereal diseases at present existing in each colony.

Much useful work was accomplished and many valuable recommendations were made. It was suggested that some form of medical direction be undertaken from the Colonial Office in order to co-ordinate and guide the local medical services. The provision of facilities for free diagnosis and treatment by the Colonial Governments was advocated. Of special significance, as all with any knowledge of seaports abroad will agree, was the plea for stringent action in connection with the protection of the men of the mercantile marine. It is terrible to think of what has happened in the past—fine young fellows, in one sense the backbone of the nation, infected by loathsome and deadly diseases in British ports, arriving home uncured and spreading the disease wholesale, possibly to innocent persons. The Commissions urged the suppression of prostitution in ports—a very difficult matter, but one capable of being put in force to some extent—and also the total exclusion of prostitutes from ships in harbour. This is a most essential point. Read Masefield's *Sea Life in Nelson's Time*, in order to realise what used to happen on the king's ships. The Navy has, of course, long been free from such disgraceful conditions, but aboard vessels of the mercantile marine there still occurs not infrequently a state of matters calling for immediate remedy, and that remedy must be

applied, in the words of the commissions, "with an iron hand."

The question of self-disinfection was not, of course, mooted, the council from which the commissions emanated being at that time opposed to such a measure. In any case self-disinfection is not a method capable of application amongst untutored natives. It would be useless, for example, amongst the inhabitants of an East or a West African town. Hence it is never likely to come so largely into use in the British tropics as in this country and in the great self-governing Dominions, where, we may note in passing, the campaign against venereal disease is being prosecuted with great activity.

Here we are able to cite only one example, and we take New Zealand, because as recently as 1922, a Committee of the Board of Health reported upon venereal diseases in that country.

Its recommendations, which we quote, are interesting, for it will be seen that they deal with the marriage question, and also favour so-called conditional notification. At the same time this committee found itself opposed to "anticipatory prophylaxis," or the "packet system" for the following reasons:—

1. That the system suggests a moral sanction to vice ;
2. That the individual is lulled into a false sense of security, and may thereby be encouraged repeatedly to expose himself to infection ;
3. That the individual may be thereby deterred from seeking early advice or treatment ;
4. That the drugs supplied may be used for treating disease should it arise, and so delay may result in seeking skilled treatment in the early stages when it is likely to be most effective.

In this respect the committee was behind the times, as shown by the findings of the Trevethin Report, and no doubt in the light of these findings, it would now be prepared to modify its strictures and, like the two great Societies in England, fall into line with the views and suggestions expressed in that report.

Here are the recommendations, excellent as far as they go:—

"The committee stress in the strongest terms the duty of moral self-control.

"They urge the cultivation of a healthier state of public

opinion. The stigma at present attached to sufferers from venereal disease should be transferred to those who indulge in promiscuous sexual intercourse.

" Parents have a great responsibility as regards the instruction and training of their children, so as to safeguard them against the dangers resulting from ignorance of sexual laws. There is too little parental control generally in New Zealand. The Committee recommend the training of teachers, and provision for giving appropriate instruction in schools.

" Classification and, where necessary, segregation of mentally defective adolescents is recommended.

" The following medical measures for preventing and combating the disease are recommended :—

" The clinics should be made more available by being open continuously. Every effort should be made to secure privacy. A specially trained nurse should be in attendance at women's clinics, and women doctors should be secured where possible.

" The Committee recommend that provision be made at the clinics for prompt preventive treatment of those who have exposed themselves to infection.

" Lady patrols should be appointed in other centres to perform the kind of work that is being carried on in Christchurch.

" The Committee, having regard to the good work, especially of an educational nature, which is being done by the Social Hygiene Society, Christchurch, consider voluntary effort of some kind in other centres would be very helpful.

" The Committee are entirely opposed to the Continental system of licensed brothels, or a revival of the C.D. Acts in any shape or form.

" They recommend legislation be introduced providing for what is known as conditional notification of venereal disease. It will be the duty of a doctor to notify to the Health Department, by number or symbol only, each case of venereal disease he treats. If a patient, however, refuses to continue treatment until cured, and will not consult some other doctor or attend a clinic, it will then be the duty of the doctor last in attendance to notify the case to the Department by name.

" If the patient continues recalcitrant and refuses to allow himself to be examined by the medical practitioner appointed by the Director-General of Health, then the latter should be empowered to apply to a Magistrate for the arrest of such person and his detention in a public hospital or other place of treatment until he is non-infective.

" The Committee also recommend further provision to deal with cases in which persons suffering from venereal disease are not under medical treatment and are likely to infect others. If the Director-General of Health has reason to believe that any

person is so suffering he may call on that person to produce a medical certificate, which may be procured free of charge from any hospital or venereal-disease clinic. If the person refuses to produce such a certificate he or she may be taken before a Magistrate, who may order a medical examination. Penalties, including detention in a prison hospital, should be provided for recalcitrant cases. The proceedings in all these cases are to be heard in private unless defendant desires a public hearing.

"The Committee recommend that before a licence to marry is issued the intending parties must sign a paper answering certain questions as to freedom from communicable disease and from mental disease, and must make a sworn statement that the answers to such questions are true.

"They recommend the adoption of a provision in the Queensland Act making venereal disease a ground for annulling a marriage contracted whilst one party is suffering from such a disease is an infectious stage, provided the other party was not informed of the fact prior to marriage. Also that it should be the duty of a medical practitioner attending a case of venereal disease, if he has reason to believe that the patient intends to marry, to warn him or her against doing so, and if he or she persists it should be the duty of the doctor to notify the case by name to the Director-General of Health, whose duty it should be to inform the other party, or the parents or guardians of such other party. Such communications made in good faith either by the doctor or the Director-General of Health should be absolutely privileged.

"The Committee recommend that the law prohibiting treatment of patients for venereal disease by unqualified persons shall be strengthened, and suggest that the Pharmaceutical Society might assist in preventing such practices."

The concluding remarks of this committee are also well worth transcribing, for they are framed on fine and broad lines and lay stress on the necessity of elevating the moral tone of communities.

"The Committee in carrying out their task have been brought into contact with some uninviting aspects of our social life. Some of the facts disclosed are of a character to give serious concern to those lovers of their country who rightly regard it as exceptionally favoured by nature, and desire to see its people healthy and vigorous, clean in body and mind, worthy of their heritage. The late war showed that the pick of our population, physically as well as mentally, were of the finest possible type, the admiration of all who saw them; but the medical examination of the recruits disclosed that of 135,282 examined after the

introduction of the Military Service Act—mostly young men in the prime of life—only 57,382, or say, 42½ per cent., could be accepted as fit for training, unmistakably proving that the nation as a whole was much below the standard of physical fitness which it ought to exhibit.

“The investigations of the Committee show that already there is far too large a proportion of mental and physical defectives reproducing their kind. In the absence of accurate statistics it is impossible to say what proportion of these defectives are the direct product of venereal disease, but there is clear evidence that a tendency to lead dissolute lives is especially noticeable in the females belonging to this unfortunate class. ‘A feeble-minded girl,’ says Mr. Beck, ‘has not sense enough to protect herself from the perils to which women are subjected. Often amiable in disposition and physically attractive, they either marry and bring forth a new generation of defectives, or they become irresponsible sources of corruption and debauchery in the communities where they live.’ Obviously some method of dealing with mental defectives—by segregation or otherwise—must be found as part of the problem of dealing with venereal disease.

“As regards the effect of venereal disease on the general health of the community, we have the statement of the late Sir William Osler that he regards syphilis as ‘third on the list of killing diseases’; while Neisser, a leading authority, says that ‘with the exception of measles, gonorrhœa is the most widely spread of all diseases. It is the most potent factor in the production of involuntary race suicide, and by sterilisation and abortion does more to depopulate the country than does any other cause.’

“In view of the facts brought out in the course of the inquiry, the Committee are strongly of opinion that it would be criminal neglect to allow the evil to go on without taking energetic steps to check its ravages. They believe that the legislative and other measures which they recommend for the medical prevention and treatment of venereal disease will, if given effect to with the loyal co-operation of the medical profession, have a very beneficial result in reducing the prevalence of disease, and will save an incalculable amount of sorrow and suffering which in too many cases falls upon the innocent. In what is proposed in this report there is nothing approaching a revival of the old Contagious Diseases Acts. To use the words of Dr. Emily Seideberg, the principle of the legislation now proposed is ‘To improve the health of the community, and not, as in the old Contagious Diseases Acts, to make sexual immorality safe for men of low morals.’

“The Committee are of opinion that, far from conditional

notification and compulsory treatment on the lines proposed being prejudicial to women in any way, it is they who will reap the greatest benefit from these measures. In fact, sufferers from venereal disease, as a whole, have everything to gain and nothing to lose so long as they will continue under treatment, and to enable them to do this the best medical skill is placed at their disposal free of cost. The only persons in the community who will be penalised by the proposed legislation are those who, having contracted venereal disease, are so reckless and unprincipled that they will take no pains to avoid communicating it to others.

"The Committee, it will be seen, regard the legislative and medical measures which they propose as of great importance, but with all the earnestness at their command they desire in conclusion to emphasise the moral and social aspects of the question. With the changing social conditions, especially in the larger towns, we are losing the home influence and home training which are the best safeguards to preserve the young against the temptations and dangers which beset their path in life. The Committee would impress upon parents the paramount duty they owe to their children in this matter. There is also a duty cast upon all leaders of public opinion, and upon the community at large, to do what is possible to bring about better living conditions, especially for girls in the towns, to encourage all forms of healthy sport and amusement, and to cultivate a higher moral standard. Whatever sanitary laws may be passed, and whatever success may be attained in dealing with bodily disease, there can be no true health if the soul of the nation remains corrupt. If this inquiry should serve to remove some of the popular ignorance regarding venereal disease, and to quicken the public conscience so that appropriate steps may be taken to deal with this dreadful scourge, the Committee feel that their labours will not have been in vain."

We have exceeded the limits of our space, but we feel that this section would be incomplete if we did not give some idea as to how educational propaganda should be conducted.

Perhaps the most important item is the education of the educators and happily in connection with this subject, we are able to reproduce a programme of the instruction given in the course of lectures on social hygiene organised at Paris at the Musée Pédagogique by the Comité National; it forms part of a useful paper by Professor Gougerot which appeared in the now defunct *International Journal of Public Health* (1921).

The following are the details :—

1st Lecture.—Danger of venereal disease. Necessity for propaganda and the co-operation of all. Methods of propaganda and of educating educators.

Demonstration of the peril of venereal disease by three methods ; (a) Statistics of morbidity and mortality; (b) Cost in thousands of millions; (c) Demonstrations of the injury caused by the three venereal diseases; lesions caused by soft chancre and gonorrhœa (films, anatomical illustrations, and lantern slides).

2nd and 3rd Lectures.—Lesions of acquired syphilis; lantern exhibitions and a film showing a visit to some hospitals.

4th Lecture.—Hereditary syphilis (illustrated by lantern slides).

5th Lecture.—Treatment of patients with venereal diseases. Hygienic education of patients.

6th Lecture.—Organisation of services for the treatment of patients, clinics, workers' consultations, rural treatment. Suppression of quack treatment, etc.

7th Lecture.—Campaign against the sources of infection.

(1) From extra-venereal causes; precautions and regulations of public hygiene. (2) Infection in marriage. The medical certificate of health. (3) Infection outside marriage, the danger of prostitution. Various systems in vogue amongst the great nations, State medical control, control by regulation, Abolitionism.

8th Lecture.—Improved regulation. Elimination of the factors of disease, prostitution, medical supervision and hygienic education. Investigation of the sources of infection.

9th Lecture.—The campaign against the causes of infection by means of moral education and social reform.

(1) Radical methods of preventing prostitution and the rescue of the prostitute. (2) Protection of men from the prostitute. (3) Suppression of pornography.

10th Lecture.—The civil and penal offence of conveying infection. Personal prophylaxis.

11th and 12th Lectures.—Education and anti-venereal propaganda; tracts; notices; leaflets; lectures, etc., in the various sections—primary schools, institutions of post-scholastic instruction and sports clubs, workers societies, apprentices, army and navy, women's organisations. Organisations or propaganda by the creation of a bureau of information.

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13th Lecture.—Film plays on the venereal danger.

14th Lecture.—Visit to the museum of Saint-Louis Hospital.

It may be asked, is there anything to show for all that has been attempted? There is, and perhaps the hopefulness of the outlook is best appreciated by a consideration of what has happened in Belgium, a small, compact and closely settled country, where an intensive anti-venereal campaign was undertaken with energy immediately after the war.

According to Professor Bayet the circumstances now justify the hope of complete extinction of the endemic of syphilis in time by sterilisation of the contagious. In his own service the proportion of "new" cases of syphilis has dropped to 20 per cent. from the 85 per cent. recorded in 1905 and 1906 in 2500 cases. He believes the endemic is approaching extinction, and pleads for concerted instructional action and the institution of preventive measures at all the great seaports of the world. This is important from the imperial standpoint, for naturally British ships are not confined to British ports. He also draws attention to the need for checking the adulteration of drugs used for sterilisation.

It is to be feared this country is not so far advanced in the way of results as Belgium, but the remarkable achievements recorded in the Navy and Army lead us to hope that in civilian life also there will ere long be noticeable a vast improvement. It is urgently needed, but fortunately the way to secure it is now well known and of proved utility. As Sir George Newman once remarked, "The prevalence of venereal disease is a stain upon our civilisation, and education; enlightenment, early skilled treatment and a wholesome public opinion form the anchor of our hope."

PART III

SOME IMPERIAL BURDENS

CHAPTER I

MATERNITY AND CHILD-WELFARE

It is not our intention to furnish full information as regards the various measures which have been devised and which are in force to safeguard the health of mothers and their children. This is readily available from many sources, and we propose merely to survey this important section of health work in a very general manner and accord prominence rather to what is being done abroad than in this country.

"The death-rate of infants is the most sensitive index we possess of physical welfare and of the effect of Sanitary Government." These words of Sir George Newman enfold a great truth, a truth, moreover, which is readily demonstrable by a study of the sanitary history of nations, of colonies, even of single towns. By Infant Mortality is denoted the number of children out of every thousand born who die within the first twelve months of life. This figure in England at the present day is in the neighbourhood of 60, in some parts it is even less. Thus, the most recent returns for certain districts in this country are: Bootle County Borough 75, Stafford Borough 67, Cambridge Borough 68, Ramsgate Borough 57, Chingford Urban District 56, Barnstaple Rural District 56, Finchley Urban District 43. Fifty years ago 160 was nearer the mark. These being some of the figures for Great Britain, who rightly considers herself in the forefront of sanitary advance and is generally looked up to by other nations as a leader in carrying out sanitary reform, what are we to think of the following records relative to British possessions? Bombay 436.37 in 1918, Madras 360.7 in the same year, Mandalay 443.3 in 1916.

When we are faced by such an appalling condition of things as is here revealed, an array of questions presents itself to our minds urgently demanding reply; among them:

What are the causes of this huge mortality? Are these causes preventable? What steps are being taken to remedy this state of affairs?

Firstly then, a few words as to the causes of this high mortality. Amongst a large number we may cite the following as the chief :—

1. *Neglect at Birth.*—Generally speaking, the unmarried mother and the illegitimate child are both sadly handicapped. The former often has to keep at work as long as possible, is subjected to the mental worry of desertion and a hopeless future, and has to trust herself to unskilled attendance; the latter, unwanted, uncared for, has to struggle from the very moment of its birth against adverse circumstances. All this is evidenced by the returns of infantile mortality among those born out of wedlock. Let us take again some of the districts whose figures have just been quoted, and what do we find? In Stafford the proportion of illegitimate children dying in the first year of life to that of the legitimate per 1000 is as 5 is to 2, in Finchley 4 to 1, Chingford 7 to 2, Bootle 3 to 1, the actual figures being respectively 167, 173, 200, and 234.

Abroad the conditions of poor attendance and neglect are even worse. In the recent Delhi Report it is stated that amongst the natives "the most ordinary fee for the midwife is one rupee with perhaps a few old clothes, and this includes not only attendance at the confinement but also menial and often degrading service during several days afterwards." Can we wonder at a high mortality under such conditions as these? One shilling and fourpence and an old suit of clothes as the customary remuneration for so-called skilled attendance on a parturient woman at the time of labour and for part at least of the puerperium! But this is not the worst. "Amongst the poor, four annas is a common fee if the child is a boy, two annas for a girl." One wonders whether, with the modern Westernisation of the native, if a poor woman gives birth to twin girls, the bargaining propensities of the East grafted on the discount system of the West will result in the hardworked midwife having to be satisfied with 'two for three halfpence.' Further comment is hardly necessary. The bad conditions accompanying parturition, such as are described in the Delhi Report, arise largely from native habits and superstitions, some of which conditions only education can improve; others can be removed by a supply of skilled aid at such times. There prevails in India a native idea that a woman

at the time of child-birth is ceremonially unclean and that, therefore, the event must take place in some closet or out-house, usually with dung-plastered floor and walls, at best in a room not used generally by the family. The attendant, owing to this idea of uncleanness, belongs usually to the lowest class, and we see in this fact the reason for the frequent deaths of infants from tetanus neonatorum, and of the mothers from sepsis and puerperal fever. Secondly, there is a notion, by no means restricted to the East, for one finds it prevalent among many of the better educated persons of the West also, that fresh air is harmful for both the mother and the child. In the West this is shown merely by huge fires and closed windows; in the East the poor mother is allowed to remain for a week, possibly a fortnight, unbathed and in the very foulest of atmospheres, and that at a time when the vitality is low from exhaustion and loss of blood. Thirdly, superstition; this takes many forms, but one may be specially mentioned, namely, the feeding of the parturient mother. A "low diet" (whatever this indefinite term may mean), is the rule after confinement, and the unhappy patient has to submit to a diet of rice and pepper water, or perhaps a decoction of copper coins and bamboo, truly a poor start for the drain of prolonged lactation. If the mother escapes with her life she is in many instances permanently injured by neglect at child-birth and thus, even more than in civilised countries, the dictum that the obstetrician provides the work for the gynaecologist holds true.

2. *Faulty Feeding.*—The new-born infant far from infrequently has to contend with many dangers. It is fed at irregular times with any variety of food, re-fed when it cries if food is at hand, left unfed for hours together if food is scarce. Irregular feeding means irregular sleep and this leads to peevishness and fretfulness, the crying then being allayed by more food. Thus arise intestinal troubles, vomiting, diarrhoea, perhaps resulting in death from exhaustion or from debility and intercurrent disease—for the poor child a happy release. In life it is the start that counts. Once the little body is weakened or bad habits are allowed to form, it is a very uphill task to restore the strength of the former and eradicate the latter.

3. *Disease.*—Apart from intestinal and dyspeptic conditions—conditions definitely preventable—there are certain other diseases which constitute a danger to the new-born—syphilis, gonorrhoea, tuberculosis, malaria, for example. The

first two of these will be considered elsewhere, the third also ; suffice it here to say that amongst native races tuberculosis is largely of domestic origin and consequently to a great extent remediable. Malaria, again, is in considerable degree preventable, if only action is taken on the lines of existing knowledge.

Our second question : Are the causes of high infantile mortality preventable ? has been in great part answered in the foregoing. Clearly, if the conditions of child-birth were improved there would be less danger for the mother, less risk for both mother and child, and a reduction of the high death-rate of infants. But this is beginning too late ; good maternity attendance and hygienic surroundings will do much, but assistance and preparation with supervision in the pre-maternity period will accomplish much more.

To produce healthy children both parents must be healthy, yet how often do we see, even in our boasted civilisation of the West, the fair, frail, tuberculous subject undertaking the responsibilities of marriage and the risks of maternity ! In order that the parents may be healthy there is need for the services of the hygienist—good housing, proper surface drainage, pure water-supply, well-cooked food, adequate conservancy. When we note the deficiency of air, light, food, the presence of dirty, gloomy surroundings, such as are found amongst the poor, need we be surprised that children brought up in such circumstances become rachitic ? Seeing this, some philanthropist steps in, fosters these poor derelicts, and as soon as they come to years of indiscretion, they proceed to propagate their kind, for it is the poor and weedy who are most attentive to the Old Testament command " Be fruitful and multiply."

Passing on to the next stage, Maternity. Cleanliness in labour, rationally carried out, presupposes a knowledge of the dangers of uncleanness, both as regards the mother and the child. Much, we might say most, of the blindness of children, amongst natives results from neglect of the eyes at birth, while most of the disasters which befall the mother come from misdirected and unnecessary interference ; hence the need for trained midwives.

We shall see later what is being done to achieve healthy childhood and parenthood, but it is obvious that the reply to our question as to the preventability of the high infantile mortality is emphatically in the affirmative, and the means can be stated in very few words : for healthy parenthood,

general hygiene ; for healthy maternity, cleanliness and common sense. Pregnancy is physiological, not pathological ; it is a natural condition and not a disease, though circumstances of modern life tend to make it so or lead to its being regarded as such among Western peoples, while ill-health, neglect, or wrong treatment help to make it so among the Eastern. Infant care may be summed up as attention to bathing, feeding, clothing, to home cleanliness, fresh air and sunlight.

Lastly, we come to the question as to what is being done, and we will briefly indicate at the same time what yet remains to do in the way of bringing about a better state of things in respect of Maternity and Child-welfare.

By the Notification of Births (Extension) Act, 1915, Local Authorities were empowered to make provision for the care of expectant mothers, nursing mothers, and young children, and another Act, three years later, the Maternity and Child Welfare Act, extended the scheme to children up to five years of age, not at schools recognised by the Board of Education. The following should all find place under such a scheme :—

1. An ante-natal clinic for giving consultations and advice to expectant mothers, and arrangements for visiting at their homes those unable to attend.
2. A Maternity Hospital or special beds in some institution where complicated cases could be admitted, and arrangements for providing skilled attendance during the confinement of such as remained at home. This would necessitate trained midwives.
3. Arrangements for treatment of any complications in mothers and infants subsequent to parturition.
4. Infant Dispensary and Children's Clinic for consultations, advice, and treatment.
5. Systematic visiting of infants and children.

Some four or five years ago the suggestion was made in New Zealand that a Directorate of Child Welfare should be established with a view to safeguarding the health of children from the time of conception to the termination of school life ; in other words, to procure continuity of action by controlling health matters through the ante-natal period, at birth, throughout the runabout stage, and on to the time of leaving school. A similar comprehensive system is now in vogue in Montreal. This is, of course, ideal, provided it does not usurp too much the duties of the parents, and we may

safely say that those who inaugurated so far-seeing a policy will be too wise not to foresee the dangers of relieving parents of the responsibilities which they incur in bringing children into the world.

In the Far East an enormous number of infants are abandoned by their parents. It was part of the duty of one of the authors of this book to examine into the deaths of persons found in the streets of Hong Kong, and every day of the year there were six to ten bodies of children, from a few hours to a few months old, which had been left in the streets or deposited on the steps of some Convent or other. These Convents do wonderful work in saving child lives, but when one considers that in a small island such as Hong Kong, some 3000 infants died abandoned in the course of a year it is obvious that the numbers sacrificed in China alone must be incalculable.

In Indo-China, Hong-Kong and elsewhere, therefore, crèches or orphan asylums were built and arrangements were made whereby those who were childless could adopt one or more of these little derelicts. To cite one example :—there recently died at Tonkin an aged Annamite who had adopted over a hundred children and kept them until suitable situations had been found for them. Those in England who do not know this system are led by ill-considered statements to think that the rescued children are sold into slavery. Thus there has of late been an agitation against it, and the righteous indignation at the idea of "slavery in a British Colony," which is felt by that type of Briton who is content with a superficial view of things, has led to the suppression of the Mui Tsai system (as it is called), with the result that the home conscience is soothed, but at the cost of doing untold harm to thousands of little children.

At Hanoi, again, at the School of Medicine, midwives receive an excellent training, which includes also the subject of puericulture. Yet further, at all kinds of schools—the University, the Normal Schools, and others—lessons in Hygiene are given and Infant Hygiene receives special attention. These courses are more complete at some places than at others, but the University course is particularly good, and is taken usually by any who are desirous of becoming inspectors later. Hanoi is even in advance of us in that respect, since for some time past law students and those whose aim in life is administration, or commerce, or agriculture, have as part of their courses a weekly lesson in

hygiene, to enable them to be of service to others in whatever walk of life they select for their own.

When the subject of "Welfare" is broached one must remember that the question is not restricted to infants. The proper care of adults has its beneficial effects on the young. Welfare work has been described as "the provision by the management for the workers of the best conditions of employment." This is not merely a question of philanthropy, as short-sighted managers and employers of labour regard it. For managers of works and factories to be interested in the health and well-being of their operatives is in part philanthropy or common humanity, and in much greater part good business, a means of increasing industrial efficiency. The undertaking as a whole, as well as the individual, is the gainer by improvement in the health and comfort of the workers; the success of the undertaking and the welfare of these workers are so intimately connected, that neither can be secured alone.

In India, at Ahmedabad, Sholapur, and elsewhere, special dispensaries for women and children, under the charge of women doctors and nurses, have been established in the cotton-mills, while in the mill-compounds a kind of crèche or day-nursery has been organised, where the children of those working in the mill are left and looked after. As a result it is found that, instead of coming to their work grudgingly and with the fear of disasters at home during their absence, the mothers come willingly and do their work better and more steadily, knowing that their little ones are being properly cared for.

An indication of what is being and may be done was afforded by the Exhibition held in Delhi in 1920, which proved to be of inestimable educational value. Papers were read on various subjects relative to Maternity and Child-welfare and practical illustrations were given of the dangers of bad sanitation in general and the advantages of good. In addition to the Pre-maternity and Maternity problems, which have already received sufficient mention, there was an Infant-welfare section relating to children under one year, dealing with the sleeping, bathing and feeding of infants, the use of protective mosquito-nets, the nature and frequency of meals, artificial feeding and the sterilisation of bottles, exercise without risk of chill permitted by the adoption of loose clothing, the use of "pens" for toddlers, and so forth. The question of baby-shows was discussed and, as usual, one took

place, but proved no more satisfactory here than it does elsewhere. Every mother considers that her own child is a Hebe or a Ganymede, or, as they say in the West Indies, "Eb'ry John Crow t'ink him pickan'ny white," and the judge must have ten times the hardihood of Paris in venturing to give his decision, for the disappointed mothers invariably say, and believe, that the prize was given by favouritism, or because the successful mother was in a position to obtain better nourishment and finer raiment for her candidate.

There was also a Childhood section to aid in guiding the development, both physical and mental of older children. Toys were provided, clay for modelling, and sand for digging, while the general hygienic education was started thus early by teaching washing of hands before meals, decent manners at the table, and the use of a tooth-brush.

For the education of the parents there were models of dwellings, showing the advantages of cleanliness, light rooms and fresh air over the conditions prevailing in the ordinary bazaar quarters, of a maternity hospital with its out-patient room for consultation and advice, its labour room, its lying-in room, compared with the outhouse already mentioned. Lastly there were demonstrations illustrative of various points of domestic hygiene and sanitation, dealing with housing in general, malaria, and mosquitoes, flies and disease, rats and plague, tuberculosis, small-pox and vaccination, milk protection, and so forth.

The question of alcohol is in the main dealt with elsewhere, but in connection with child-welfare one special point may with advantage be mentioned here. Statistics drawn up from a large series of cases show that amongst the children of alcoholic mothers the mortality is more than double that amongst those of non-alcoholics, 55 per cent. as against 23 per cent.

Summing up the matter as to how much should be done in our tropical possessions to protect mothers and children we would say that, as regards the mother, arrangements might be made for her to be attended by a trained midwife, and to that end more facilities might be afforded for the training of suitable women; that such women, having obtained their certificates, should be registered, and none but registered midwives should be permitted to attend labour cases. Secondly, a system of Health Visitors, such as are employed at home, should also be organised for service abroad, their duties to include calls upon the mothers in their houses and

giving advice to those with new-born babies. Such a system is in action in some parts of the British tropical possessions, but, the advantages being so obvious, it is a matter for wonderment that it has not been adopted in them all.

With respect to the larger question of the degree to which the State should look after the offspring when they come to riper years, one wonders sometimes if all the care, examinations and free treatment cannot be carried too far. The problem of fostering and tending the weakly and unfit and allowing them to propagate their kind will always be a difficult one. In default of being condemned to euthanasia, they must be protected both for their own sake and that of the race. It is said that in the colonics mental deficiency is undoubtedly increasing, because the conditions present make for increase. Those actually insane are provided for, but the feeble-minded wander at large, and "the feeble-minded woman is twice as prolific as the normal woman."

There are some who assert that in the England of to-day, every care seems to be taken of the children by others than the parents. They point to clinics, medical examinations, free spectacles, free meals, easy hours, learn-as-you-please methods, prosecution of teachers by parents whose children have been corrected, cheap or free medical treatment continued even when adult life is reached, payment for not working, and all the rest of it. It is true that fostering care and dry nursing of a nation, if carried to excess, result in a loss of self-reliance and lack of initiative. They rear the type of men who "down tools," against their conscience, will and better nature, at the bidding of some irresponsible agitator. Hence too often we witness a communal protest or the dislocation of the trade of a nation, merely because some member of a union or brotherhood has been discharged for drunkenness, neglect, or incapacity. Again, the ludicrous absurdity of a "school-children's strike" because of dislike of a teacher or disagreement with some disciplinary measure emphasises the necessity for the sound training of the younger generation. Yet careful inquiry will show that, so far as medical care and inspection are concerned, there is little reason for the fears which some have expressed, as every effort is made to prevent parents slirking their rightful responsibilities. In this connection a recent paper by Dr. F. Wood, Medical Officer of Health for Bootle merits careful study (*Journal Royal Sanitary Institute*, November, 1923).

It is enough to say that the more Spartan upbringing, the

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endurance of hardships, and the consequent survival of the fittest, not the *undue* fostering of the weak, made Britain a glorious nation, and enabled her to maintain her supremacy against countless difficulties. Let us remember then when helping the weak and sickly in a reasonable and sensible way, that we have also a duty to the strong and healthy, that all cannot be submitted to a uniform system, that it is by its use and not by being kept in cotton-wool that an instrument fulfils its end, that it is by meeting and overcoming temptation and not by being safeguarded from it that the boy becomes a man. Finally, is it not better in all circumstances to wear out rather than to rust out? There is no happier man on earth than he who can say with his hand upon his heart :—

“ What matter if my days be few, so they be well filled ? ”

CHAPTER II

ALCOHOLISM

It is not easy to deal with the question of the effects of alcohol on the Health of the Empire. The subject is associated too intimately with propagandist efforts on the part of Prohibitionists and biased assertions emanating both from them and their opponents. Many are inclined to forget that Use and Abuse of alcohol are not one and the same thing, and that alcoholism is a term applicable only to the latter.

It is not only those who drink unadvisedly who speak unadvisedly with their lips. The "Alcohol Question" creates as much animosity in discussion as does religious controversy, or a conversation between a "Salisbury" enthusiast and a vegetarian uric acid faddist.

Arguments are brought forward, or rather statements are advanced as arguments, on both sides with but the smallest modicum of scientific foundation; experiments of science, falsely so called, are related with elaborate detail; but many of these experiments are useless and misleading because they have been performed without controls in some cases, without adequate controls in most.

There are those who state that the taking of alcohol in moderate or even minute doses produces gross changes in the mucous membrane lining the stomach, and leads to kidney disease, cirrhosis of the liver, diabetes, and, of course, cancer. Such exaggerations do more harm than good.

Before we pass on to describe the baleful effects of Alcoholism amongst native races it will perhaps be as well to clear the ground a little by a few remarks as to the actual effects of alcohol in small doses. Where experiments have been carried out in a scientific manner and with proper controls, alcohol was found to be easily resorbed and to undergo combustion rapidly. It was proved—we speak of small doses only at present—to stimulate the flow of gastric juice and the movements of the stomach, and was thus an aid to digestion.

Psychological tests have been tried, such as noting the number of mistakes made by a typist after taking an alcoholic drink with or between meals. These were brought forward

as a proof of the evil and depressing effects of small doses of alcohol. However, the fallacy of this "post ergo propter" argument has been shown by a control test which indicated that quite as many mistakes were made when the subject had substituted ginger-beer or coffee for the incriminated alcohol.

Let us give a few facts and quote the results of one or two tests carried out by men scientifically minded, unbiased by prejudice, and seeking only for the truth.

Alcohol has been designated a "food-drug": a food in so far as it can supply useful energy to the body; a drug in that it has the property of modifying the function of living matter.

Physiologically it has been shown that small doses, by depressing the higher centres, "release the brake on the thalamus and so allow freer play to the emotions. Feelings of joy, misery, anger and excitement, are more easily called forth, and, with cares and worries forgotten, a feeling of light-heartedness usually develops," but the cares and worries are still there. Again, in starvation and exposure alcohol brings a sense of comfort such as no other drug can bring; the blood-vessels are dilated, a feeling of warmth pervades the body and, as just stated, anxiety and worry are forgotten; hence alcohol comes to be regarded by the poor, ill-used sport of fate as a panacea. But what, in reality, is the manner in which this sense, this false sense, of well-being and freedom from care is brought about?

Firstly, the sense of warmth is illusory. The blood-vessels of the surface dilate, and there is consequently a *feeling* of warmth, but this flushing of the surface leads to increased loss of heat and is actually associated with lowering of the body temperature.

Secondly, experiment has shown that alcohol produces a limitation of range of thought, together with a need for greater effort to record events, an effort which is not made; this and the deadening of memory give rise to the fallacious sense of the lightening of trouble, truly a fallacious gain due to functional organic depression and diminution of response to stimuli.

Accurate measurements were made by Dixon and Rivers as to the amount of work which men were able to perform under ordinary conditions. They were then given a certain quantity of alcohol, their work was again measured and it was found that the amount done always showed an increase, as if "the man was out to do his very best." But this improvement was spasmodic and temporary and it did not continue

unless the alcohol was given every day and the amount was increased. Hence the danger! To maintain the result even for a time the small dose would become the large, and then the deteriorating effects of the larger intake of alcohol would replace the deceptive amelioration. Professor Collis has summed up the effects of reduction of alcohol on industry in these words: "Alcohol possesses a charm for removing the irritating effects of industrial fatigue, but it is a charm purchased at great cost to efficiency. We now have less accidents than before, less absenteeism, no 'Blue Monday,' and more efficient output."

It is with regard to the smaller doses that so much discrepancy exists. Experience speaks with no uncertain voice as to the evils of large quantities. A few words more upon the former before we pass on to deal with the latter.

Definite evidence was obtained in testing the influence of alcohol on fatigue that small quantities of 5 to 20 c.c. of absolute alcohol (say an ounce of whisky), have no effect on the amount or nature of the work performed with a special registering instrument; not till four times that dose was taken was there a definite falling off, while as regards mental work the individual differences were so great that no inferences of any scientific value could be drawn.

So much for the work aspect; from the point of view of disease, alcohol, even when taken in moderate doses, tends to lower the resisting power of the individual, and when taken to excess it does so to a considerable extent. This is particularly true as regards pneumonia and tuberculosis, to which so many alcoholics fall victims.

So uncertain is the question whether alcohol, taken as a beverage, is or is not deleterious that at the Ninetieth Annual Meeting of the British Medical Association, held at Glasgow in 1922, in spite of the presence of many scientists and social workers who took part in the discussion, the following was the final resolution, which was passed without a dissentient voice: "That the Council of the British Medical Association be requested to assist in the promotion of further inquiry into the effect of alcohol taken as a beverage on the individual and the community."

In short, judging from the evidence obtainable, we may say that alcohol, if good alcohol and taken in ordinary doses, not at frequent and irregular times (the writer is a teetotaler) probably does no harm at all and may do good. Further information on this point will be found in Professor Starling's

recent work, *The Action of Alcohol in Man*, to which the reader is referred.

Now to turn to the other side of the picture: Taken in larger quantities, or at irregular times, the effects of alcohol, and especially of bad alcohol, on native races—"that," as Kipling would say, "is another story."

The European on arrival in the tropics receives early warning from the older residents that it is a wise plan to postpone the 'first peg' till sundown, when the day's work is done. Indulged in during the earlier hours it causes increased perspiration, the sensation of added warmth, and a consequent craving for more, and it is "the other little drinks that do a lot of harm." They become substitutes for meals, no longer adjuncts to them; they are provocative of alimentary upset, with the dire consequences known to every resident in tropical countries.

On the natives who can procure only cheap and nasty imported liquor, the "rot-gut" of the West Indies, the "alougou" of West Africa, the "tafia" of Guadeloupe, the "fire-water" of the North-West, the effects, both individual and racial, are truly appalling. The native can, as a rule, only obtain his dope surreptitiously, so he drinks heavily when he gets the chance, with the main idea of rendering himself gloriously drunk. The evil effects of alcohol—such alcohol—on the native cannot be over-estimated, the picture can hardly be painted in colours too lurid. It kills directly by its poisonous qualities and indirectly as being a cause of quarrelling and sickness, and it is, moreover, productive of much crime in general. In places where the habit has gained a hold and become a custom whole districts have become depopulated and the results are fully as disastrous, and even more rapidly so, than is the case with tuberculosis.

In warm climates the alcoholic danger is intensified. Drinking to excess undoubtedly occurs in most of them; many Europeans contract the habit partly on account of the heat, partly from sheer sociability, partly to drive away ennui; the native drinks, as a rule, whenever he can procure the liquor or the means to purchase it, and he will pay heavily for the vile decoction which may be offered to him by some unscrupulous dealers.

We have not been able to obtain authentic records from British Colonies, but in a very candid paper read by Inspector General Kermorgant before La Société de Pathologie Exotique in 1909, one is able to see what terrible destruction had been

wrought by this drug in some of the French Colonies. To quote a few examples: In New Caledonia the natives were naturally indolent and when they had been introduced to the pleasurable effects, as they thought, of alcohol, they developed such a longing for it that at the time dealt with in the report they could be induced to work only for a week at a time, in order to earn enough to enable them to get drunk the next. The liquor obtainable was some inferior alcohol euphemistically called "Cognac" by the merchants who sold it to them, adulterated with sugar, tea, and pepper. In Oceania the Tahitian is very fond of alcohol, and if, as is usually the case, he is unable to afford the American and European products, he will make some substitute himself. To check the evil the Administration in 1894 interdicted the importation of alcohol; alcoholism diminished for a time, but soon the rule became more honoured in the breach than in the observance. In the Marquesas, in addition to the importation of rum, the natives make a product of their own with the indigenous fruits and arrange regular orgies. It is said that forty or fifty will foregather, load a boat with the liquor, and at the rendezvous "men and women, stark naked, drink and dance until they are absolutely intoxicated."

In the Indies callou—the fermented juice of the buds of the coco and other palms—and arrack—an eau de vie prepared from the palm sugar or a low grade of molasses—are used. Primitive methods of distillation lead to the retention of secondary products, which not only impart their flavour to the compounds but increase greatly their toxic properties. The mixtures are in great favour amongst the lower class natives, of whom many are confirmed alcoholics. Those higher in the social scale drink liqueurs and whisky. This habit, the author states, was spreading more and more, even amongst the women and children, in spite of its being prohibited by law. In French Indo-China the Europeans can procure cheaply absinthe and all sorts of adulterated drinks, the consumption of which often renders them quite maniacal.

In Réunion arrack and rum are the staple beverages, and the latter is given even to infants of tender age. In the *Journal de la Réunion* for January, 1903, it is stated that 3742 litres of rum were being consumed daily, representing a cost of 9000 francs, and associated with intellectual, moral, and physical degradation of the people. In spite of the knowledge of this state of matters, which was made the text of many a sermon, the people remained indifferent and refused

to break off or even check a habit having such dire consequences.

Madagascar, again, suffered greatly from alcoholism until General Galliéni instituted severe penalties for the infringement of laws regulating the sale of alcoholic beverages. Ten years later, after a period of amelioration, numerous cabarets were set up in the Province of Tuléar, liquors of bad quality were again being sold clandestinely, and drunkenness and tuberculosis began to show a marked increase. At Martinique and Guadeloupe "tafia" was taken to an enormous extent, the majority of the people regarding it as a necessity to enable them to work; on account of its cheapness it was known among them as the "poor man's wine," and many employers made matters far worse by paying their labourers in part with this concoction, while some, it is said, paid the whole of their workers' salaries in such kind. At Guadeloupe nearly two million litres of rum were produced per annum, but that was not found sufficient for local consumption. In the dependencies of Saint Martin there is, or at all events was, no duty, and alcohol was sold at a ridiculously low price, so that many would drink as much as a litre of rum daily; in Saint Barthélemy there was an alcoholic in every family, and 80 per cent. of the prisoners had committed their crimes when in a state of intoxication.

In French Guiana and in the Antilles alcohol "takes first place as a cause of lunacy, and it is the most fruitful source of admissions to asylums, hospitals and prisons. Most of the drinking is done at home." In Saint Pierre and Miquelin at that time (1898) matters were even worse. Many alcoholic products were consumed, named by courtesy "wines." They were sold at a low price and women, young girls, and quite little children would drink them in large quantities on an empty stomach "as a tonic." Boys would leave school at twelve to fourteen years of age and, accompanying their fathers to work, would fall into the same habits, and the fathers would proudly call their friends' attention to the fact that their sons could "take drink like a man."

In the West African colonies the natives were greatly addicted to their *alougou* and, in fact, would not engage themselves to work unless it entered into their daily ration. Attempts to suppress it met with much opposition, partly from this fact, and partly because its importation and consumption formed a very considerable item in the revenue.

The Conference of various nations held at Brussels in 1890 to devise means to combat the scourge and to which we have referred, imposed a tax of 15 francs on each hectalitre of alcohol imported; this was soon raised to 25 francs. In 1899 another conference decided to make the tax 70 francs for 50 per cent. alcohol and 140 francs for absolute. Contrary to expectation, the result was not a diminution of drinking but impoverishment of the people, for it was found that, whereas in 1898 there were 40,760 hectalitres imported, in 1904 the amount was 83,501 hectalitres. A strong argument for the Prohibitionists!

We shall see shortly what has been done in one or two British colonies to check the evil, but in the countries whose condition has been described above the remedy is not a simple one, as many think. If importation is forbidden by law (this has been tried), the native soon learns to concoct his own alcoholic beverage from some indigenous product. If the cabarets were all closed down the result would be but small because, as has been stated, most of the drinking is done by the people at their homes.

Portugal helped considerably to solve the difficulty by legislating against the importation and manufacture of alcoholic beverages, while at the same time sugar manufacture was encouraged by giving preference to that produced in her own colonies.

The following summary of the Resolutions passed at the meeting of 1909 already referred to, constitutes a guide for dealing with the question and has to a certain extent been followed in the Durban Scheme which has proved so wonderfully effectual:—

“ La Société de Pathologie Exotique considering that in warm climates, even more than in temperate zones, alcohol is the most potent and widespread cause of the decay of indigenous races and that, moreover, it paves the way for tuberculosis.

“ Bearing in mind also that, though alcohol is a source of revenue and bulks largely in colonial budgets, it at the same time helps to fill the asylums, hospitals and jails; that this poison in its work of decay brings about a steady depopulation of races under our protection; that, from the threefold aspect of civilisation, humanity, and colonial development, it is our duty to safeguard the natives from the evils which are destroying them.

“ La Société de Pathologie Exotique recommends:—

“ 1. That the importation of trade alcohol (*l'alcool de traité*) be prohibited in our possessions;

- " 2. That all spirituous liquors be highly taxed and their alcoholic strength limited ;
- " 3. That the number of public-houses (débits de boisson) be regulated ;
- " 4. That under no circumstances are commercial houses or employers of labour to be allowed to give their employés alcohol either as a ration or as part payment of salary."

Reports on the prevalence and effects of alcoholism in British possessions are not so graphic as those here given, but one at least will later be mentioned where conditions, though described in general terms, were sufficiently bad to call for urgent reform, and excellent results were achieved.

It must not be forgotten that while alcoholism is a disease in itself, its effects are not by any means limited to the individual affected ; as in syphilis, so in alcoholism, the sins of the fathers are visited upon the children. Statistics have shown that it has a large influence upon Infantile Mortality. Abortions are found to be more frequent in alcoholic mothers or women with alcoholic husbands. Bezzola and Schweighofer showed that conceptions occurring during times of carnival and vintage were apt to result in still-births or idiots. Also among inebriate women 6.2 per cent. produced still-born children at their first parturition, but 17.2 per cent. in later gestations.

Experimental evidence here again is doubtful or misleading. Stockard by careful research arrived at the conclusion that there was "no proof that alcohol ever caused abnormal development in the human embryo," though he cautiously adds that his experiments did not prove that it might not, and his animal experiments certainly tended to show that it did ; on the other hand, equally careful observers have stated that indulgence in alcohol by either parent is a danger to the offspring in the germinal, embryonic, foetal, and post-natal periods. "Sterility shuts it out from life altogether, abortion brings about a cessation of its vitality in early ante-natal existence ; still-birth is the signal that it has succumbed on the very threshold of its post-natal life, and when it does enter the door it passes in weakened and predisposed to infantile morbidity and mortality."

Intemperance in the mother leads, among other things, to irregular feeding of the child, to careless cleansing of bottles ; the surroundings are often bad—overcrowding, general insanitary conditions, risk of accidents, and so forth. The

difficulty of this subject is due, in part at least, to the fact that it is so intimately bound up with other questions—bad hygiene, venereal disease, illegitimacy with its risks of high mortality, etc.

Space forbids our saying much more upon this subject, but it would be left in a very incomplete state were no mention made of the "Durban Scheme."

The Town Council there has entire control of the manufacture and sale of the native beer; all profits are given over to a "Native Administration Fund," which defrays expenses and institutes improvements on behalf of the natives. No alcohol above 4 per cent. strength is made, and its sale to females or to boys under fifteen years of age is prohibited. Schools, eating-houses and model dwellings have been erected with the proceeds of the scheme, which has proved eminently successful.

The example of Durban has been followed by other South African municipal bodies, and the "Durban Scheme" was recommended by one of us for application to Mauritius on reception of the Report of a Commission appointed by Sir Hesketh Bell in 1919, to inquire into the prevalence and effects of alcoholism in that colony.

The habit there had spread from the Creoles—who had for many years indulged in excessive rum-drinking—to the Indian and Indo-Mauritian populations, who succumbed more readily to its effects, so that the colony was in danger of being ruined owing to ill-health and loss of efficiency.

The interests of the industry conflicted so greatly with the moral aspect that a fair and acceptable remedy was far from being obvious. Thus, the State derived part of its revenue from the liquor traffic; the distillers who sold to the trade and the traders who retailed it to the public, the planters as suppliers of the cane and molasses, all depended for their livelihood on the production of alcohol, whereas its excessive consumption conflicted sadly with public health, racial advancement, and labour efficiency.

In Mauritius the average amount of rum consumed per annum for the ten years 1909-1919 was 1,022,785 litres. In 1919-1920 (the year in which the investigation was undertaken) the total reached 1,832,589 litres, roughly 80 per cent. more than the average of the preceding ten years, and all this without any abnormal change in the population. It is an indication of the rapid growth of an evil habit, and this in turn is ascribed to the multiplicity of opportunities for

obtaining liquor (there was more than one drink-shop to every 200 inhabitants), to defective control of the shops, to the alcoholic strength of the products sold, to the long hours during which the shops remained open, and, lastly, to ignorance of the dangers of alcoholism.

Although the government of this colony did not think it advisable to adopt the provisions of the "Durban Scheme" in their entirety they enacted a Liquor Law in 1922, the effects of which measure, in spite of the brief period which has elapsed since it came into force, have surpassed the most sanguine expectations. These results cannot be better expressed than in the words of the Governor himself, Sir Hesketh Bell, in his speech at the opening of the session of the Council of Government in May, 1923.

"The consumption of local rum during the current year is not expected to exceed 500,000 litres, as against nearly two millions of litres for the preceding twelve months. . . . The reduction of the colony's consumption of spirits, in one year, by nearly two-thirds, is a most remarkable fact, and especially when we remember that it has been brought about with a minimum of friction and complaint. . . . Instead of 1183 shops for the sale of liquor, we have now only about 150, and no shops are allowed to be opened on Sundays. The Police reports, as may be expected, show a remarkable decrease in cases of drunkenness, and they also show an equally satisfactory reduction in cases of murder, violence and all other crimes which are frequently due to the abuse of liquor. The effect on the labour supply has also been most satisfactory . . . the quality of the labour has considerably improved. . . . The loss of Revenue from the reduction in the consumption of alcoholic liquors has of course, been very large. . . . It is a pleasure to state, however, that this loss has been much more than recouped by a general increase in Customs duties, showing that much of the money that was formerly wasted on drink is now being spent on the purchase of useful goods and manufactures."

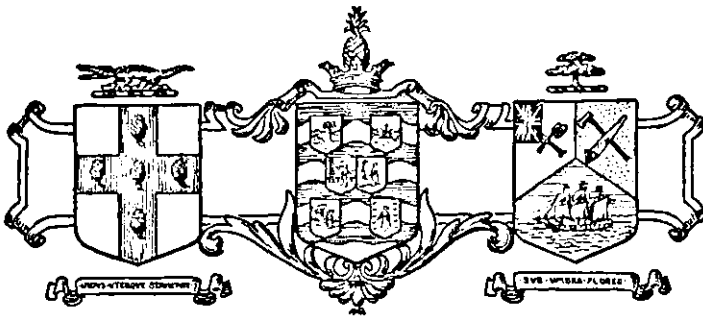
Total prohibition did not find favour either in Durban or with the Mauritian Commission. Revenue is essential for the development of all colonies, and alcohol duties, for importation or manufacture, or selling, bulk largely in that revenue. From the economist's point of view, therefore, some other source would have to be tapped to provide the equivalent. From the moral aspect Prohibition is a premium on fraud and encourages the introduction of contraband. The main lines

on which reform measures might be based would be, briefly, the suppression of home stills, the supervision of authorised distilleries, or constituting alcohol manufacture a State monopoly; instituting hygienic control of beverages, limiting the number of licensed houses and raising the cost of a licence, forbidding alcohol as part of a labourer's ration, and disallowing its use as part payment of salary. From an instructional point of view those convicted of drunkenness (we speak of the colonies) might be put to do some work of public benefit, road-making, building, etc.

It is never wise to omit the usual recommendation of the Health Officer, namely, propaganda and "education" as to the dangers of alcoholism. It is true that the results of educative work in other avenues of sanitary science are *under existing conditions* not altogether encouraging. People are already fully aware of the dangers of sleeping without a mosquito-net in districts infected by malaria and yellow fever, they know perfectly well the risks they run of contracting venereal disease by promiscuous intercourse, they do not need telling that alcoholic excess is harmful; yet, at the present time, we have still to rely on the penal regulations against leaving rubbish, tins, etc., unmoved and stagnant pools untreated, and on the drainage of swamp lands in order to diminish malaria and other mosquito-borne diseases. It is the precautionary measures and early treatment which have reduced the incidence and severity of venereal diseases, not merely educational propaganda insisting on the dangers of promiscuity. So it is very doubtful whether diatribes on the evils of alcohol as such will diminish alcoholism. Appreciation of the fact that self-respect has been lost, realisation that his indulgence has led him to act foolishly, or—a more powerful deterrent to some natures—has allowed himself to be made a fool of by others, these are more likely to be effectual as controlling agents than a cinema film of a drunkard beating his wife or dying miserably of cirrhosis of the liver and chronic nephritis.

The imparting and the dissemination of knowledge, valuable though they be, are not yet synonymous with the procuring of action in accordance with that knowledge; would that it were so! Knowledge is one thing; to prevail upon individuals to apply their knowledge is quite another. In years gone by every soldier knew the dangers arising from venereal disease, nevertheless the contraction of it in some form was regarded as the "guinea-stamp of manhood," and

the author has actually heard senior men in the Army lay down the dictum, "No recruit is worth anything until he has had his dose." Later, when the soldier found that his ill-advised indulgence entailed loss of pay, and delayed promotion, this, and not the knowledge *per se* of the resulting evils, was the cause of the decline in the number of admissions to hospital. So with alcohol: the knowledge of its evils is there; what is needed is a code of judicious measures to protect the individuals of the race from themselves. The alcoholic is his own worst enemy.



Arms of

Jamaica. Leeward Islands. British Honduras.

CHAPTER III

THE DRUG HABIT

ADDICTION to narcotic drugs is not a national, not even a wide-spread failing of the British, but since many of the sons of Britain "venture trade abroad," and spend the best years of their lives in Colonies, Dependencies, and in foreign countries where such habits are rife amongst the natives we cannot omit altogether a subject of such importance in a work professing to deal with Health and the Empire.¹

The taking of drugs often starts merely as a foolish experiment to obtain a new sensation; with increased frequency the indulgence becomes a senseless habit, weak at first but gaining strength with each successive dose, till in the end the slave becomes the master and sets about forging silent fetters whereby the devotee becomes a prisoner so bound by the chains of his vice that all efforts at escape are vain.

That the habit of drug-taking is reprehensible no one in his senses will deny, not even the addict himself, for each lapse affords such a pitiable exhibition of the lack of self-control. At the same time, putting aside for the moment the moral and ethical aspects, it is absurd to pretend, as many do, that all drugs are equally detrimental to the physical and mental well-being of the subject.

The question of alcohol has already been discussed. Let us now say a few words upon other drugs, the employment of which is supposed to bring such dire evils in its train, to cause physical ruin, mental degeneration and moral degradation. We may begin with the one most widely used, probably, therefore, the most important—Opium.

There has been much ill-considered speaking and much irresponsible, hysterical writing on the evils of this drug. Opium does undoubtedly work a certain amount of harm, more particularly through its derivatives, but exaggerated statements and unsupported magnification of the evils for which it is responsible, besides being scientifically immoral, will not in the long run prove as adequate a deterrent as the plain unvarnished truth.

¹ Interesting information on the use of opium and habit-forming drugs in the Union of South Africa will be found in the Health Department Report for 1923.

The effects of opium depend very largely on the way in which it is taken, whether by eating, by smoking, or by injection of one or other of its derivatives. These cannot be classed together as all equally harmful; most decidedly they are not.

In 1895 a Royal Commission on the question came to the conclusion that opium was a valuable domestic medicine, that it did good in many cases of fever, that it acted as a preventive against malarial attacks; at all events there was evidence to show that malarial prevalence was less among opium-eaters. In fact, it was until recently a popular remedy in the Fens "to ward off the ague." It was found that the drug was well tolerated taken in this way, particularly if food was plentiful, that it "ameliorated the lot of the underfed man," and that in India it was the universal household remedy. "It is extensively administered to infants and the practice does not appear to any appreciable extent injurious." Moderate indulgence in opium-eating, it was considered, had no harmful effects, and did not tend to shorten life; on the contrary, it was definitely of service in warding off sickness. So little was the practice regarded as injurious that the Commission did not condemn the export of Indian opium to China and elsewhere. Such findings would doubtless not now be so frankly stated. In fact, some ten years later the House of Commons condemned the Indo-Chinese opium trade as "morally indefensible" and in another eleven years succeeded ostensibly in bringing it to an end.

The importation of opium to China having officially ceased, the Chinese, after a time, took up the cultivation of the poppy with greater zest. In the earlier times the Chinese, who are by no means the terrible examples of the effects of "dope" that those who have never visited China nor come into contact with the race would have us believe, used to eat opium for the alleviation of their ailments and as a prophylactic against disease. They thus tasted the delights, the insidious charms of the drug, and by the help of unscrupulous traders were introduced to the use of Morphine—but of this we will speak later.

Smoking opium is under certain conditions a more pernicious practice and is indulged in merely as a habit, to satisfy a craving which soon becomes irresistible, and not for beneficial ends such as the treatment and prophylaxis of disease.

This fact was recognised long since. Nearly two hundred years ago, in 1729, an Imperial Edict was promulgated in

China forbidding the smoking of the drug, and when it was found that the prohibition was evaded or ignored the importation of the drug into Canton was stopped. Large quantities, however, have without intermission been smuggled in, and in some provinces, particularly those in the interior, the cultivation has been carried on and even encouraged for the revenue it brings in.

The merchants and the better class of Chinese generally, when they smoke, do so for mere politeness and sociability. Callers are offered a pipe just as a visitor in England is offered a cigar or cigarette. Good opium is used and little, if any, harm results. It certainly does not affect the general health of the smokers; it equally certainly does not affect them mentally, for the Chinese, all of them, are keen on a bargain; and finally, not even the most prejudiced can say that it affects them morally. The author has talked with many, merchants and others, who have frequent dealings with the Chinese; all without exception speak in terms of the highest praise of their honesty, reliability and good faith, and many are the instances related where faith is kept "though it be to their own hindrance." Although without a religion in the usual acceptation of the term they have a code of morals which is a high one, and the manner in which they act up to and live by that code affords an example which other nations of the world would do well to follow.

This is a fair statement of the case as regards the better class merchants and the well-to-do who indulge in opium-smoking, but, when speaking of the poorer classes, there is a different tale to tell. For them the best opium is too expensive, they use the impure drug and re-smoke the ashes or residue again and again.

The amount of alkaloid absorbed from the fresh opium is but small; much of it condenses or is held back in the juice at the bottom of the bowl and in the stem. What does come through, however, is rapidly absorbed, so that the effects—a feeling of elation followed by comfort, freedom from anxiety, and an exalted sense of superiority—are practically immediate. The craving is not developed at once and in the early stages the cure is relatively easy. In the East the habit is practised at home or in company; when people of the West take it up the evil is greater because the vice is carried on secretly and amid the worst surroundings.

The pipes are small; ten fills would contain only the equivalent of about half a grain of morphine and, as has been

said, most of this is destroyed by the smoking, the amount absorbed from a single pipeful being almost infinitesimal. A man who smoked twenty or even forty pipes a day would absorb only about a grain. The poorer man, however, not only has to put up with inferior opium because of the expense, but he absorbs far more of the drug and its products as he stirs up the gummy residue and re-smokes it time and again.

Owing to the reduction of importation into China from India, and to prohibition of the use of opium, the habits of eating and smoking the drug have largely given place to the infinitely more degrading and harmful method of injection of the alkaloid morphine. Moreover, this modification is indulged in more secretly. Just as secret drinking is a more dangerous vice than the communal, "good-fellowship" use of alcohol, so the morphinist, the injector, is more a slave to the drug than the smoker, who is generally an open "group" partaker.

With the morphinist the dose has to be increased to produce the desired effect, the craving is formed earlier and is much more intense. Fifteen grains constitute quite an ordinary dose for the addict in the West. In China the prohibition of the comparatively harmless smoking of good opium is leading or rather has already led, to the use of morphine, so that an ordinary ricksha coolie while waiting for a fare can and does obtain an injection from some itinerant pedlar, whereas he was quite unable to indulge his propensities for smoking to anything like the equivalent extent.

But we must not in a work of this nature, by dwelling too long on the question of opium as it is taken by the Oriental, forget our chief aim, namely, to warn the European of the dangers which may confront him when he goes abroad.

Much of the increase in drug addiction, much of the misery and evil resulting therefrom, has been started in ignorance, by foolishly striving for a new sensation. Opium-smoking is at first looked upon merely as a harmless pastime, adopted "just to see what it is like," only an experiment, capable of being relinquished at will. Then comes the gradual establishment of the craving, the increased indulgence in secret, followed by the difficulty of procuring the crude drug in larger quantities, which leads to its replacement by the more easily concealed hypodermic syringe and the little tablets and the smaller but more dangerous dose—*Facilis descensus Avernii*.

As Professor Dixon has stated, in civilised communities at the present day those who are addicted to the use of

narcotics are rarely the dull and phlegmatic, but, on the contrary, such as are possessed of quick perception, acute sensibility, and high mental attributes. Such subjects are markedly reflex and respond readily to external influences; in them "the associations set loose by any ordinary stimulus cause such a complexity of cerebration that the ordinary affairs of life become a burden." Mental activity readily brings on fatigue with its concomitant depression and anxiety. The simple daily trifles and inconveniences, which would by most people be disregarded or merely give rise to a transitory annoyance, are exaggerated so much that mountains are made out of mole-hills. By the use of a narcotic such unfortunate persons are enabled to shut themselves off from contact with reality and the outside world, and as the habit becomes more deeply rooted they merely drift along as weeds half submerged in the stream of life.

The morphinist is not mentally defective, and in spite of all the arguments that have been adduced there is no real proof that drug addiction is a cause of insanity, neither does it lead to serious nervous disease sufficient to call for mental treatment, though, of course, the devotee becomes less and less useful to the community in general and wrecks his own career. "The addiction commences as a vice, but the developed craving becomes a disease."

On the contrary, the drug-taker is in many cases, possibly in most, a psychopath to begin with; the drug does not cause the mental upset, though it may exaggerate it; the reverse is more usually the case, the mental instability leading to the development of the habit. Some even go so far as to assert that normal persons never develop into "dope-fiends." We may even go further: when one compares the modern standards of living with that of a few decades ago, one cannot help being struck by the extensive increase of nervous instability, of hyper-sensitiveness. This condition of things has grown up *pari passu* with civilisation, and the amassing of wealth. Moreover, the great spread of the drug habit of late years is probably an aftermath of the strenuous years of the late World War, and the consequent multiplication of psychopaths.

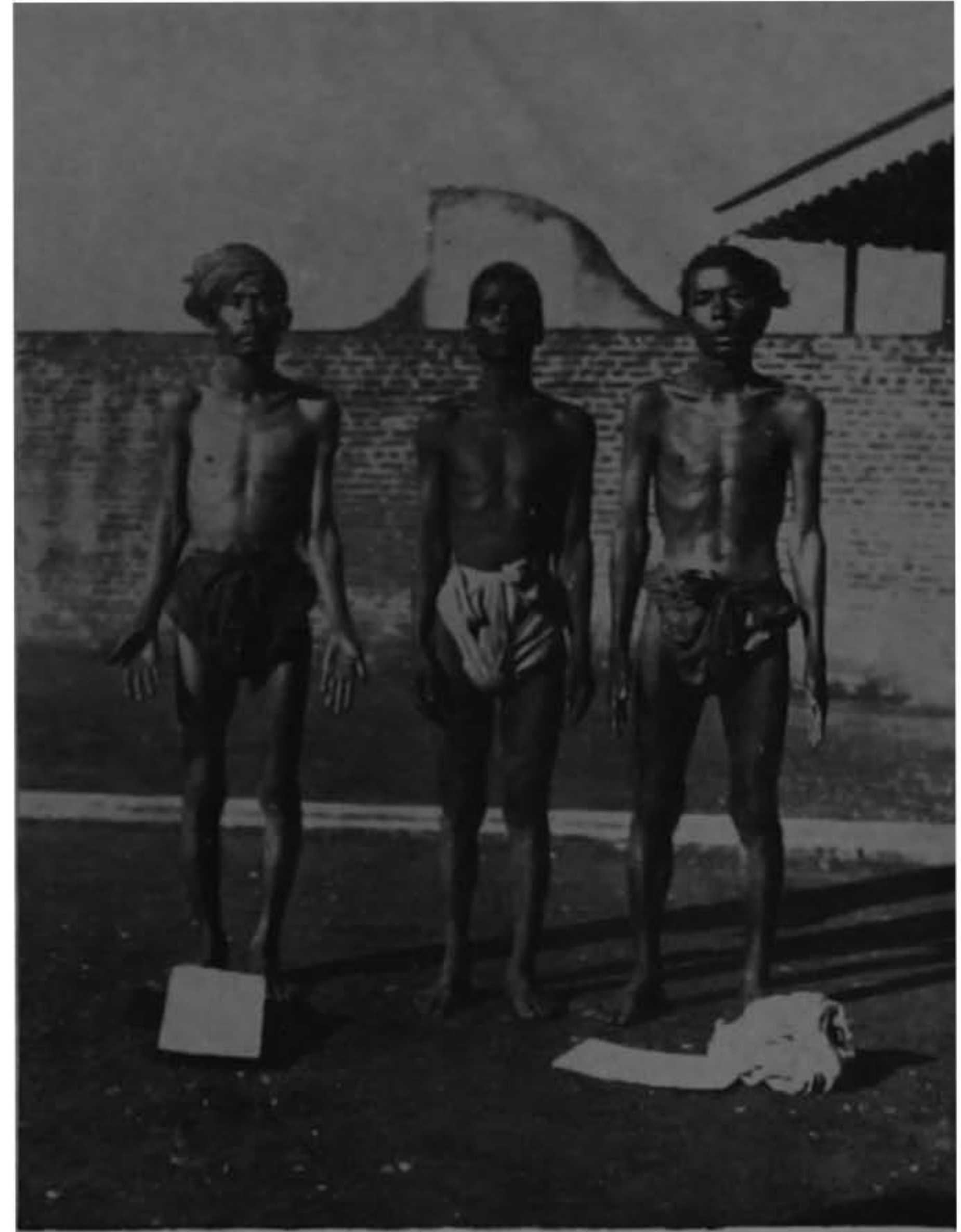
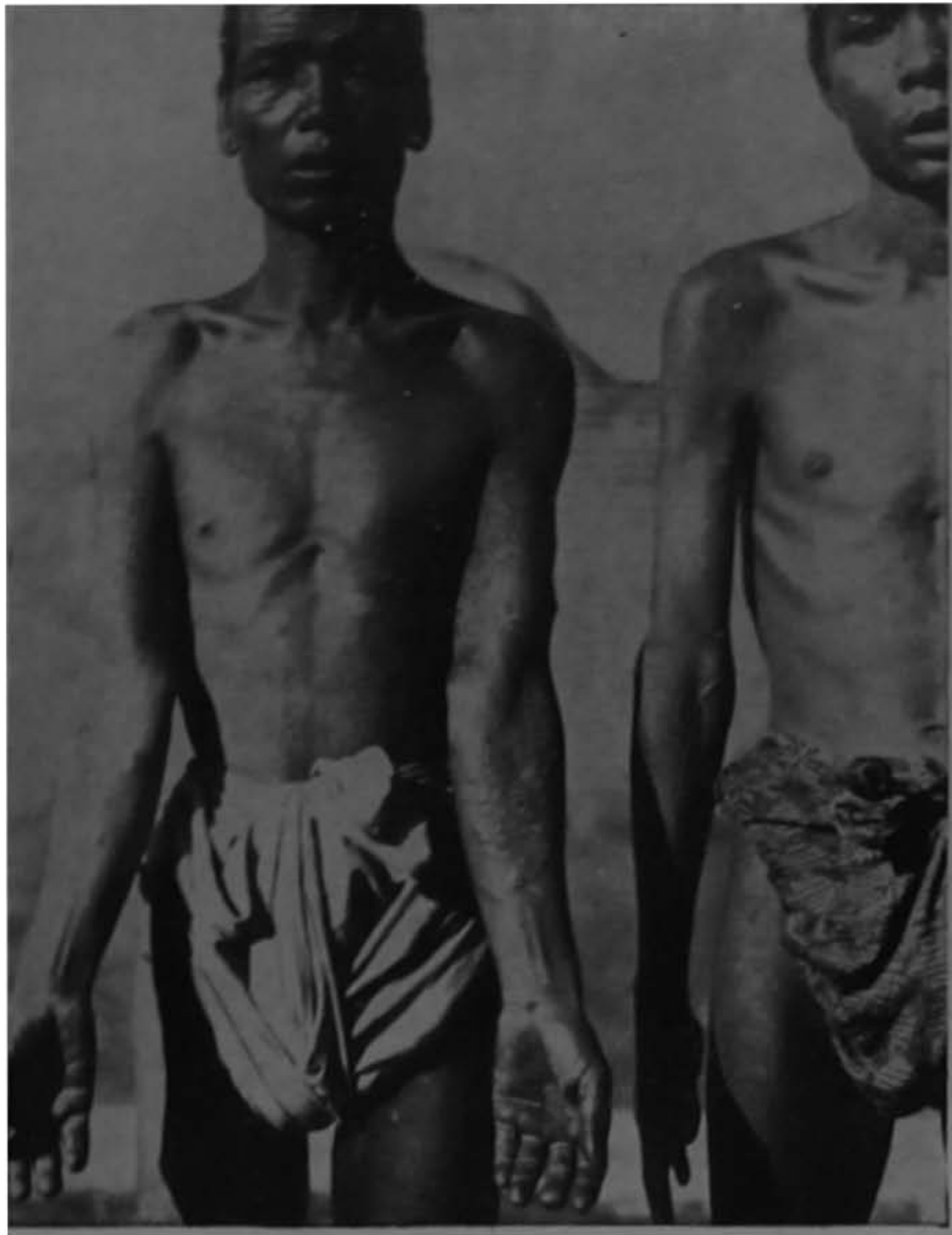
New York statistics have recently demonstrated that amongst a large number of cases of drug addiction one-third had acquired the habit when under the age of twenty years, one-half under the age of twenty-five years, while more than 70 per cent. were below thirty years of age. There is a

considerable amount of evidence in favour of the fact that difficulty in obtaining alcohol leads people to make trial of any substance which may have a stimulant effect and, seeing that "Legislation for hard cases makes bad law," we may perhaps trace in some degree to the legal efforts and the restriction of alcohol on the part of ardent prohibitionists the rapid increase in the numbers of those who indulge in the far more dangerous narcotic drugs. Prohibition enthusiasts maintain, on the contrary, that there is little, if any, connection between them, on the grounds that alcohol appeals to a different kind of mentality. To what extent prohibition has affected addiction to drugs is an undecided question, but we are certainly on safe ground in saying that the whole evil cannot be ascribed to such a cause, for the increase began before prohibition, and inquiry in many instances has revealed the fact that one source of the trouble has been, and is, the deliberate and systematic initiation of young persons into the vice by drug pedlars.

In India and the East addiction to drugs, and especially opium, is mainly a habit of middle and advancing age, whereas, as has already been stated, a low estimate records that 70 per cent. of the "Western morphinists" are under the age of thirty years.

But since neither England nor America grows the poppy as an industry, we are naturally led to ask: Where do the drugs come from in the first place? Opium, the source also of morphine and heroin, is produced in India, Persia, Egypt, Turkey and China. In the last named the growing is largely carried on in defiance of the law, but in India there is an extensive organised cultivation, manufacture, and sale. Thus in 1919-20 the output for this country alone was nearly 1000 tons. Further, at Indian ports there is a flourishing illicit morphia traffic. The demand for the drug is increasing in up-country places and the price at which it is sold in the United Provinces and the Punjab is Rs. 80 an ounce.

The Shanghai Commission of 1909 and the Hague Conferences held between 1911 and 1914 gave abundant proof of the almost universal abuse of "drugs of addiction," and pointed out how necessary it was that control should be not merely national but international, in order to limit the production to what was needed for medicinal and legitimate purposes, terms which should be synonymous in this regard. How vast must be the excess will be clearly seen on perusal of the following figures. Sir William Collins has said that "the



Burmese and Indian morphia addicts. Note needle puncture marks.

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dispenser of a large hospital with 8000 in-patients and 130,000 out-patients used in one year less than 13 lb. of opium, and 5 oz. of morphia," yet, as already indicated, India alone had an output of 971 tons.

To controvert the possible charge that we are dealing in generalities or indulging in rodomontade it will not be amiss to give a few figures taken from a brochure issued by the League of Nations. Exports of opium from British India to various countries in 1919-20 were :—

Hong Kong and Macao	869 chests
Straits Settlements (including Singapore)	4025 "
Mauritius	35 "
Ceylon	60 "
French Indo-China	995 "
Dutch East Indies	2000 "
Other Countries	<u>2525</u> "
Total	10,509 "

The export chest of opium contains 140 lb. The principal importers recorded under the head "Other Countries" are Japan, Siam, and British North Borneo. *No opium is exported from India to the United States of America or to Great Britain.*

From factories in Edinburgh, London, Germany, America and Japan as much as 28 tons of morphine has been smuggled into China in a year. Morphine is packed by the western merchants, transferred from Britain across America in bond, or from the United States direct through the Japanese harbours to the smuggler. The declared imports of morphine to Japan itself in 1920 were :—

¹ England	5010 kilogrammes.
France	3950 "
Germany	900 "
Belgium	1400 "
Switzerland.. ..	2260 "
Holland	125 "
¹ U.S.A.	9230 "

¹ The figures relative to England and the United States have been the subject of hot dispute, and we believe that Japan has acknowledged that the returns in respect of these countries are inaccurate.

If we add that a pound of morphine will suffice for 28,000 medicinal doses, some idea may be grasped of the enormous extent of the traffic.

The stirring romances which might be written on the smuggling of narcotics—romances strictly “founded on fact”—would put into the shade the stories of smugglers which used to delight us in our boyhood’s days. The methods of the drug smugglers are sometimes devious, but often succeed by their very openness. Here are two or three examples narrated by Basil Matthews in the League of Nations publication already referred to:—

“An innocent-looking old Chinese woman comes ashore carrying with tender solicitude a basket containing a cat surrounded by five new-born kittens. What a scene of beautiful old age caring for helpless dumb and blind infancy! But the kittens are really dead—and not only so, they have been opened and their interiors stuffed with opium and sewn up again!”

“Here is a man with a Japanese rug under his arm. ‘Unroll it!’ Certainly—it is unrolled and contains nothing. But here again we are at fault; for while the woof of the rug is true material, the warp is made of tiny paper cylinders—all filled with ‘dope.’”

“A Chinese or Japanese man comes ashore and raises his straw hat politely. The Customs Officer in what seems an excess of interference raises the hat again from the owner’s head—and between the true crown and the false crown he discovers ‘dope.’”

“A railway train comes sliding into a station from Manchuria. Ransack every compartment and you will fail to find anything; but if in a wild fit of universal suspicion you search the steel tubes that form part of its engineering construction, and, in addition, unscrew some of the ventilators in the roof, you will find morphine in both.

“The train carries a water-tank—full of water. Obviously it is useless to search there, for no morphine can be in the water. But our undaunted and remorseless quest leads us to fish in the tank, only to find water-tight bags—full of morphine.”

The object of the Conventions in 1909 and subsequent years was “to bring about the gradual suppression of the abuse of opium, morphine, and cocaine; as also of the drugs prepared or derived from these substances, which give rise or might give rise to similar abuses.” The United States of America, and Germany, though they did not join the League

of Nations, gave valuable help and advice, and it is rumoured that even Turkey is "favourably considering adhesion to the opium convention," and that Persia, although she made certain reservations at the time, is now likely to join wholeheartedly in the good work, and, seeing that these two countries are large producers of opium, this is indeed "a consummation devoutly to be wished."

Little need be said about the use of Heroin. It has largely gone out of fashion, and is mainly of historical interest, in that in earlier times it was used as a substitute for morphine under the erroneous idea that it was not an opium derivative. There is evidence, however, pointing to the fact that in the United States heroin is in common use among the young addicts, and, as already stated, in that country a large percentage acquire the habit below the age of thirty years.

Before leaving the subject of opium and its derivatives, in case we may be thought to have overstated the evils, it will not be amiss to say a few words to show the degree of narcosis wrought by the drug on the nervous centres and the higher functions. This is best seen and most graphically exhibited when an addict is unable to obtain his "dope," and the symptoms which Professor Dixon has termed the "withdrawal symptoms" are in evidence as the nerve-cells re-awaken in a hyper-excitable state. These symptoms show a close correspondence with stimulation of the tissues whose functions morphine in small doses depresses. The

"yawning, sneezing, nausea, vomiting, and mucous secretion result from stimulation of the medulla; the abdominal pains and diarrhoea from stimulation of Auerbach's plexus; the twitchings, cramps, circulatory troubles, sometimes actual convulsions and collapse . . . are due to excessive stimulation of the cortical cells. A patient seen with these symptoms, on receiving an injection of his drug, exhibits a transformation almost miraculous, he becomes in a few minutes a relatively normal person."

"Whatever peculiar characteristics of mind," he adds, "may determine the formation of the habit, when once it is formed the patient has a real disease and he can only exist free from great physical and mental pain when he is under the influence of the drug to which he is addicted."

Next, a few words on the subject of Cocaine. This, as is well known, is a dangerous drug when taken recklessly. Instances of death occurring from overdoses of "white snuff,"

as the alkaloid is called, are always sure of full reports in the papers, and each case is usually made the most of by hysterical correspondents who clamour for dire penalties on all having anything to do with cocaine. A kindly government, in true parental fashion, striving to pacify her noisiest children, has therefore so restricted the traffic that smuggling of the drug has increased enormously, while even medical men can only with difficulty obtain it for humane uses in their practices.

Cocaine is the alkaloid derived from the leaves of the *Erythroxylon coca* of Peru. The native Indian there takes the leaves as a mental and physical stimulant and as a means of counteracting fatigue, just as the European does his tea or coffee; he finds that on a long and trying journey he can allay the sense of fatigue and the pangs of hunger and of thirst by chewing the leaves. In Europe, however, the alkaloid only is employed, mainly by injection, though it was soon found out that the effects could be more speedily brought about, owing to the greater rapidity of absorption, if the powder were taken in the form of snuff; herein lies the great danger, for by this route the dose cannot be accurately regulated and an overdose is inadvertently taken.

The indulgence in cocaine has made great strides in India of late, at all events much more is being smuggled into the country. Vigilant Customs Preventive Officers during 1921-22 discovered 263 oz. of it, whereas, during the five months ending March, 1923, as much as 475 oz. fell into their hands; the amount which escaped their watchfulness can only be conjectured.

Cocaine acts differently from morphine; the latter, as we have seen, causes a depression of the sensory brain cells, allaying the sense of fatigue and pain, both physical and mental. The action of the former is that of a powerful cerebral stimulant, giving rise to mental excitement and restlessness; the sensations of fatigue and general lassitude pass off because the weary and jaded nerve-cells are whipped, as it were, into activity. There is at the same time a clouding of the associations, and the stimulation is succeeded by a marked depression. This drug, therefore, entices on its victims by the very rapidity with which it relieves the sensations of fatigue, weariness and exhaustion, and drives away gloom and melancholy, substituting a feeling of mental activity and physical vigour.

Tolerance, which morphine so readily sets up, is much more slowly acquired and to a less degree with cocaine; thus, in

spite of a widespread notion that cocaine addiction is worse than morphine, the withdrawal symptoms are not so severe, and instead of gradually reducing the dose as in treatment of morphine devotees, in the case of cocaine one can cut off the drug immediately without danger.

Though serious enough, the cocaine habit, as compared with that of morphine, is of relatively minor importance, and persons addicted to cocaine are in the majority of instances morphinomaniacs also.

Lastly, a word or two about Indian Hemp (*Cannabis indica* or *C. sativa*), which is cultivated throughout India. Of this there are three or four preparations, namely, Ganja, which consists of the dried flowering tops with a coating of resin; Bhang, the dried leaves and a few stalks; Charas, the resinous matter which contains the chief active principle. This last preparation corresponds to the "haschish," the dope used by the Count of Monte Cristo to conjure up his voluptuous visions. Finally, there is Majun, really made from one or other of the foregoing, but mixed with sugar and spices and taken as a sweetmeat.

Indian Hemp may be smoked, or eaten, or drunk. For smoking it is usually worked up with tobacco and spices, such as cardamoms, cloves, musk; for drinking, the leaves and flowering tops are mixed in water with black pepper, filtered through a cloth, and to this again spices may be added; the devotee who has progressed beyond caring for this drug alone will often add Datura or Opium.¹

As with cocaine, this drug produces a preliminary sense of *bien-être*, exhilaration, and mental exaltation, followed by delusions and pleasurable hallucinations; narcotism, however, soon supervenes, with clouded vision, dizziness and drowsiness, which may pass on to coma and death.

The drug is used but little by Europeans; it has never become fashionable among them, for it does not keep well and different products are, in consequence, so variable in their active constituents that this very unreliability led largely to its abandonment. A Royal Commission in 1893 recommended its control, but prohibition was regarded as unnecessary and inexpedient.

A considerable proportion of the cases of insanity in the East has been ascribed to indulgence in this drug, but it would probably be more correct to say that the drug was but the

¹ Mitchell comments on the wide use of "dagga," as Indian hemp is called, in South Africa. (See footnote on p. 345.)

exciting cause in rousing into activity a condition latent in a person who already was on the borderline of insanity. Not only are the weak-minded more susceptible to the effects of the drug in small doses, but the excitable and highly-strung, as has been said, are more disposed to the acquirement of the drug habit.

Devotees of narcotic drugs are not numerous in England, nor among Europeans in the tropics, though, undoubtedly, their numbers have increased since the Great War. There are not, so far as we are aware, any published statistics for England, but it has been authoritatively estimated by the Public Health Service of the United States that there were 175,000¹ addicts in that country, and that 90 per cent. of the opium and cocaine imported was used for other than legitimate purposes.

In conclusion : We have already seen that the addict is usually a person of weak self-control, not "post" but "ante," his weakness being not a consequence, but a cause of his drug-taking, and by no legislative measures can a weak character be transformed into a strong one. Removal of temptation by total prohibition is impossible, because the drugs are needed for legitimate medicinal purposes, and "true temperance is dependent not on control by others, but on self-control."

Under present-day conditions, when everything is done to render life easy, or perhaps it would be better expressed by saying "to give such education even to the poorest as would fit them for a life of cultured leisure," self-control is not a virtue which is being cultivated and fostered, and, as has been said by some and felt by more, "Perhaps if children were taught something of the realities of the life into which they must presently enter, they would be in a better position to combat the difficulties and temptations to which they must presently be subjected."

¹ Latest statistics, obtained after this book was in the hands of the printers, give the number as 1,000,000. If this is not a misprint or an error in calculation, it ought not to be a matter of much difficulty to discover the cause of an increase in a few years of nearly 500 per cent. in the prevalence of drug addiction.

CHAPTER IV

THE FINANCIAL ASPECT OF PUBLIC HEALTH

FORESIGHT is one of the rarest gifts bestowed on mankind. Were it otherwise the history of the world would have been very different. What dynasties might have been saved, what wars averted, and what financial catastrophes avoided ! Yet, curiously enough, a common and favourite motto is " forewarned is forearmed," while the adage " a stitch in time saves nine " is in frequent use. In the everyday affairs of life, however, we rarely practise what we preach, and as a result pay a fitting penalty in the long run.

A Medical Officer is confronted with an almost insuperable difficulty when he sets out to request the expenditure of good money for the purpose of improving the general health and thereby the earning capacity of a community, unless he can show that the measures he is putting forward will yield a profit for the individual, and that at no distant future.

If we wish to estimate how great, even from the sordid aspect of finance alone, apart from higher motives of humanitarianism, is the value of Public Health activities we cannot do better than consider the cost of the ravages of disease when such activities are non-existent. Illustrations of the costliness of Public Ill-health are abundant in the history of every nation.

In the past Fear has been the chief instigator of sanitary reform. When, more than ninety years ago, a devastating epidemic of cholera resulted in over 40,000 deaths, the British public began to rouse itself from apathy, and appointed various Commissions to study the so-called Sanitary State of the Country, in truth the deplorably insanitary conditions of life of a large proportion of the community.

As in the case of other commissions, the members duly met and reported upon the necessity for introducing measures to improve or remove these conditions, and then, the plague being stayed, just as with other commissions, the matter dropped. " The devil got well the devil a saint was he."

In 1848 the dread scourge paid another visitation and this time took toll of 54,000. Alarm was great ; hasty means,

ever the most expensive, were debated, adopted and carried out with expedition and enthusiasm.

England rarely counts the cost until after the event, so for the financial facts of public health, particularly from the preventive aspect, we are largely indebted to others. The admirable reports of that philanthropic yet business-like organisation, the Rockefeller Foundation, offer excellent food for thought. Limitations of space forbid our giving more than a few examples. The question of finance in connection with public health matters has received mention incidentally in other parts of this book, finding an appropriate place where we deal with the health of individual colonies. Here we approach the subject from a more extensive and general point of view.

There can be no doubt in the mind of any educated person that the prevention of disease is a gain financially. What should we think of the owner of a fruit farm who, seeing the preventable destruction of a considerable proportion of young trees in the pre-bearing stage, took no steps to find out the cause and eradicate it? Yet in many of our colonies little or nothing is done to check the relatively enormous mortality amongst infants, although every child has for the State an economic value, and every healthy child a high potential value, which attains its maximum during the years of production.

“ In 1900 it was estimated that in England and the United States the economic value of a healthy male infant at birth might be reckoned at £5; at ten years of age, when he had survived the years of high mortality, this amount had risen to £200, and at the economically reproductive period at the end of the second decade £500.”

The difference between a healthy child and a puny, rachitic, invalid one is brought about by three things—good housing, good food, and cleanliness.

It will be generally agreed that it is not possible at all times to express in terms of pounds, shillings and pence the exact value of any special public health undertaking. As Dr. Raymond Pearl says: “ What is the worth to me in money that my children will not have diphtheria or small-pox? ”

As an instance of private enterprise on a small scale undertaken, not with the idea of improving public health, but for purely financial gain, which nevertheless led to such improvement, we may cite the case of a certain Life Assurance Company, which established a “ Life Extension Institution ”

to which any person insured by the Company could present himself periodically for medical examination and general advice. Records show that in two years an expected mortality of 303 was reduced to an actual mortality of 267. This meant a saving to the company of 166,000 dollars on the policies involved. The cost of setting up and working the system was 40,000 dollars, leaving a net profit of 126,000 dollars.

Some of the more important industrial firms in England are now carrying out the principles of true Preventive Medicine and are finding out how great is the commercial advantage of the venture. Cadbury with the model village of Bournville, Lever Brothers with Port Sunlight, the Daimler Company and J. Lyons set examples which might well be followed. Employees are examined as to their physical fitness prior to engagement; they are well housed and well fed; amusements and recreation are provided for them in their time off duty; there are doctors, dentists, and trained nurses to supervise their health and to take care of them when ailing. In short, a definite sum is set apart to provide for the welfare of those employed and to keep them healthy—preventive medicine in its best form.

So much for private enterprise. In the present section we will endeavour to illustrate briefly how great may be the financial gain brought about by sanitary measures properly controlled, and incidentally how vast may be the loss entailed by unpreparedness, by hasty measures, by faulty control.

A study of the history of epidemics and of the costs of emergency measures at the time of an outbreak serves to demonstrate clearly that "nothing is so costly in all ways as disease, and that nothing is so remunerative as the outlay which augments health and in doing so augments the amount and value of work done." Let us take in illustration of this the work of Gorgas in Havana and Panama. The former place, a deadly haunt of yellow fever, was converted into one of the healthiest of tropical cities. The construction of the Panama Canal was rendered possible by the conquest of malaria and yellow fever, effected by rigorous anti-mosquito measures of control. Contrast with those the terrible failure of Lesseps's attempt, a failure due to loss from sickness and death. Twenty-two thousand labourers were lost by the French in this undertaking; a thousand natives imported from the West Indies, and a thousand Chinese perished within six

months. Gorgas succeeded and the cost, it has been calculated, did not exceed one per cent. of the capital outlay.

It is difficult for any one below the status of a Chancellor of the Exchequer to infuse interest into dry figures and monetary questions, but a matter of such vital importance cannot be disregarded.

Nations and municipalities have, with a few exceptions, not yet awakened to the fact that they have been spending very large sums of money in curing, or endeavouring to cure, diseases which ought never to have occurred; in other words, in treating instead of eradicating preventable diseases. Dr. Charles J. Hastings, Medical Officer of Health, Toronto, estimated the saving effected in a single year by carrying out preventive measures regarding typhoid fever, scarlet fever, diphtheria, tuberculosis, and infantile conditions. Basing his calculations on the capitalised value of lives saved, the cost of nursing, the loss of earnings prevented, and the funeral expenses at the low rate of 20 dollars per head, he showed a saving of 2,224,750 dollars during 1915. Since the figures deal with but a few, though indeed the chief, preventable conditions, this total is really a conservative estimate.

To take yet one more instance, again from Toronto, the saving effected by efficient control of the food supply, and of only one item of that, namely, milk. The following extract from the report of the Medical Officer of Health puts very clearly the business aspect of the question.

"When we organised our Division of Milk, Dairy Farm, and Dairy Inspection in July, 1911, the people of Toronto were consuming 96,000 quarts of milk per day, but after repeated samples had been taken from all the dealers in the city, we found that 41.5 per cent. of all the milk consumed in the city was watered, and furthermore, that an average of 20 per cent. of water was being added to the milk. This meant that the citizens were paying 9c. per quart for 7968 quarts of water, thinking it was milk, which amounted to 717.12 dollars every day.

"Early in 1912, as a result of our campaign for pure, safe milk, the amount of water in the milk was reduced to 480 quarts daily, which at 9c. per quart, amounted to a total of 43.20 dollars, effecting a saving of 673.92 dollars per day to the consumer, and this for the 365 days meant a total saving to the citizens of 245,980.80 dollars for the year 1912, but there was still 5 per cent. that was watered.

"The present consumption of milk in the city is 125,000 quarts per day. Therefore, for the years 1914 and 1915, by the

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controlling of the additional 5 per cent. of milk which was still watered in 1912, and the additional consumption of milk from 96,000 quarts to 125,000 quarts per day, the citizens are now being saved over 322,000 dollars a year on this one article of food alone, which is 22,000 dollars more than the entire expenditure of the Department for 1915. Obviously, then, the maintaining of this high standard means an annual saving, but the organisation and expenditure that was necessary to bring about this saving is equally necessary every year in order to maintain this standard of safety. However, this is a pretty good return on 9000 dollars, which is the annual cost of this division."

Those who grumble at the cost of operating a Health Department and try to cut down expenses by cheese-paring methods applied to public health, lose sight entirely of the fact that they really receive for money laid out a return far in excess of any investment in which, as business people, they would never hesitate to trust their capital.

At the Ninetieth Annual Meeting of the British Medical Association held at Glasgow, in 1922, Lieut.-Colonel Fremantle discussed several points of interest in the economics of public health, such as the cost of sickness and disablement as causes of loss of work, expenditure necessitated by care and treatment, the gain resulting from reduction in the death-rate, and in the increased expectation of life. He showed that 2½ per cent. of the population are incapacitated by sickness and disablement, and that the loss to the exchequer from this is £2,500,000 per annum, while the loss of national income is £50,000,000 per annum. The net cost of care and treatment of the sick and disabled amounted to £100,000,000. The total direct material loss for England and Wales, therefore, exceeded £150,000,000.

Expenditure on the public health in its various aspects was estimated by the Ministry of Health returns at £52,076,784 during the year. By the reduced number of deaths, calculated on the figures of the previous sixty years, there was effected a saving of more than £60,000,000 per annum, and by the increased Expectation of Life another £200,000,000.

If only one preventable disease, tuberculosis, for example, could be eliminated, it has been shown that £4,700,000 would be added yearly to the exchequer, and £94,000,000 to the national income. A much larger amount than is spent on these preventive measures could, therefore, be devoted to this question and receive financial justification.

Leaving the home country let us now give an instance

or two of the financial gain accruing from measures undertaken to eradicate conditions more strictly tropical in nature. Let us take three examples in which definite estimations have been made—malaria, plague, and typhoid fever. Ancylostomiasis would also have been spoken of here, but that it has already been dealt with under its own section as adequately as space will permit.

Malaria, largely responsible for the passing of "the glory that was Greece and the grandeur that was Rome," costs, it is stated, only one-fourth as much to eradicate as it does when permitted to prevail. By simple drainage, by filling pits and shallow pools, by channelling streams, by turning in the sunlight, by oiling and by the use of quinine, malaria was practically driven from seventy towns in the Southern States of America, at the average cost of 78 cents per head. In Bamberger (South Carolina) in 1918 malaria cost some 24,000 dollars, in 1919 more than 35,000 dollars. Antimalarial measures were then put into operation and the expenditure fell in the following year to 5000 dollars, and in 1921 to less than 1000 dollars.

This is but one aspect of the question, the actual cost of the disease; there are other matters, such as the gain from improved sanitation, from enhanced earning-power of the population, from the lengthened years of productive life, and these are inestimable.

For actual figures relative to the cost of malaria prevention as compared with those of a policy of *laissez-faire*, we have but to peruse the reports of the activities of the Rockefeller Foundation. Under the auspices of the Board of Control of this wonderful institution economy goes hand in hand with efficiency; economy and parsimony are shown to be not synonymous, but radically antagonistic terms.

It is recorded that in the town of Lake Charles, Louisiana, the losses from malaria in 1920 were estimated at 26,000 dollars. Control measures were undertaken in the following year, and these, though costing less than 5000 dollars, practically stamped out the disease. In other words, besides the inestimable advantage of improved health and working capacity of the inhabitants, there was a tangible saving in hard cash of over 21,000 dollars.

Passing from the West to the East we may cite India as another example. It is calculated that the direct annual cost of sickness and death resulting from malaria in India is between fifty and sixty million pounds sterling, and this, be it noted, is

but the *direct* cost, taking no account of the even greater indirect losses due to the resultant impaired productive power of labour.

The following letter, written to the local health officer by the manager of a mill situated in a town which had suffered severely from malaria, needs no comment :—

“ I frankly admit that I could not realise what a great change could be brought about by systematic work and with comparatively little expense. The money spent in antimalarial work here has paid the quickest and most enormous dividends I have ever seen from any investment, and after having had our experience I would, if necessary, do the work over again if I knew it would cost ten times the amount. Our experience has taught us that the eradication of mosquitoes is not only the proper thing to do from a strictly health standpoint, but it is an exceedingly profitable thing to do.”

Plague is regarded with horror all the world over and there is little need of figures to drive home the advisability of spending money in eradicating it. It will, however, be of interest to note the enormous sums that rats, which by their fleas are the carriers and spreaders of plague germs, have actually cost India.

Kunhardt has estimated that during the first twenty years of the present century the rat in India, has cost :—

In mortality and disablement	..	£402,000,000
In damage to grain, property, etc.		400,000,000
In anti-plague measures	.. ..	26,000,000
Total	.. ..	£828,000,000

The average yearly loss, therefore, exceeds £40,000,000, or 7 per cent. of India's aggregate annual income.

Again, Leatherbee affirms that “ every case of human plague in a community costs at least 7500 dollars (say, £1500), and every case of rodent plague 5000 dollars.” And yet, to render a dwelling rat-proof adds but 2 per cent. to the cost of construction.

Measures of emergency undertaken in haste at the time of a scare or during an epidemic are most expensive and woefully wasteful. Moreover, the commercial and trade losses resulting from quarantine and restrictive regulations

on transit of goods and merchandise are also enormous. Thus, for example, Bombay is said to have lost £100,000 a week when plague broke out in that town in 1896.

We may mention incidentally here that plague is by no means the only disease conveyed by rats. Infective jaundice, rat-bite fever, and other maladies, such as horse-influenza and foot-and-mouth disease, are carried by these rodents, and pigs contract trichinosis ("measly" pork) through eating infected rats. Even apart from hygienic considerations rats, it has been estimated, cause an economic loss to this country of some £50,000,000 a year.

Lastly, a few words on Typhoid Fever. In England this is now so rare as to be almost a curiosity; abroad it still constitutes a serious menace and in some of our colonies exacts a heavy toll of life. The cause, however, is known, the modes of its spread are well understood, and there is no reason why cases of this disease should not become as rare in the colonies as in the homeland.

The question of typhoid fever has been dealt with elsewhere in this book, but it will be instructive to record one example of the cost of an epidemic, an epidemic which ought not to have occurred. It serves to illustrate incidentally the truth of the old adage "Penny wise, pound foolish." The outbreak took place at Salem, Ohio. The cost of this was calculated to be 450,000 dollars (say, £90,000). It was due to the bursting of a tile pipe which had been used for conveying drinking-water, and as a result of the break the water became contaminated. The question of material for the piping had been discussed and the decision arrived at was that as the tile would be 1500 dollars cheaper than an iron one the former should be installed. This "saving" of 1500 dollars led to the unnecessary expenditure of 450,000 dollars!

We indicated at the beginning of this brief section that it is in most cases a difficult matter to persuade the non-medical health authorities, the guardians of the public purse, that money spent in improving the public health will yield a monetary advantage. A man, or a body of men, will spend freely if there is but a reasonable prospect of an early return for outlay; but for the sanitary outlook, although the return is not problematical but certain, the vision is myopic, and there is a reluctance even to make trial of the lenses needed to rectify the error.

Health, as all will admit, is an invaluable asset; on the health of a nation, which is but the sum of the health of its

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constituent individuals, depend all the vital activities of the race. Taking into consideration the relatively vast improvement which has already resulted with almost a minimum of expenditure, it must be clear to all, one would think, that "prevention of disease is a financial gain." Yet the total expenditure for public health purposes in the homeland is scarcely one-thirtieth of the amount of the National Drink Bill.

At the present day, with such a small health rate as 3s. 6d. per head per annum, and this is the average for a typical County Borough (exclusive, of course, of the State's contribution), the general death-rate of the country has been reduced by nearly 50 per cent. since the time of Chadwick (1850-70), that of tuberculosis has been lowered to one-third, infantile mortality has been halved, and typhoid fever has been virtually abolished. If all this has been accomplished with so small an expenditure, a realisation of the value of health which found expression in an adequate monetary outlay would bring about a veritable millennium.

It may be said, and there is abundant evidence to support the statement, that cheese-paring methods of combating ill-health are not only inefficient, but are most wasteful and in the end more expensive, as the example given above of the Salem outbreak illustrates.

Municipal and State authorities should think not once nor twice only before they decide to cut down public health estimates, and it is indeed gratifying to note that the recent Committee on National Expenditure thought well, when wielding the economic axe, to spare the Exchequer's contribution to the Public Health Services.

Let us remember that the establishment of isolation hospitals and sanatoria for the stamping out of epidemics are measures of our failures rather than of our successes; they indicate that we have failed to prevent.

PART IV

THE OUTLOOK

IN a recent novel Mr. Anderson Graham paints a powerful picture of a ruined United Kingdom, destroyed two hundred years hence by the coloured races of mankind. If "The Collapse of Homo Sapiens," as he terms it, became an accomplished fact, our public health service would also perish, and its destruction would be one of the main factors in the downfall of the nation. Short of some such calamity it is inconceivable that our existing hygienic status should be disturbed, save in the direction of expansion and improvement.

It is alike interesting and profitable to consider the lines along which advance is required or is likely to take place, not only in England and other countries of the British Commonwealth where the conditions of life are more or less similar, but in those tropical and sub-tropical regions which, as we have seen, present special problems of their own, and many of which are sadly handicapped in the race towards efficiency and communal health. We have already indicated here and there some developments which may reasonably be expected to occur, and others which are not only desirable but essential, and it must be evident that, both at home and abroad, the trend of events in the realm of hygiene is to all intents and purposes the same. There is no hard and fast line between home hygiene and tropical hygiene. The principles governing each are identical and the advance of each is dependent on research in the first instance and on education in the second.

In both particulars, countries in the torrid zone lag behind those blessed with temperate climates, but they are much more nearly on an equality where research is concerned than when it is a question of education. Not only has research on tropical medicine and hygiene been actively and most successfully prosecuted in the tropics themselves, but the tropics are heirs to the knowledge gained in laboratories elsewhere, and such knowledge can as a rule be readily applied. It is otherwise with education. At the best this is a slow process, and in the case of many native populations the ground has to be prepared before any seeds of sanitary knowledge can be sown.

It is useless to preach the value of the open window at night to a West Indian negro who lives in terror of "duppies," just as it is wellnigh hopeless to expect some Hindu to grasp the significance of the germ theory of communicable disease while he remains saturated with superstitions and worships strange deities from whom he believes sickness and death emanate. It is the lack of education in the tropics which makes the outlook there so different from that in a country like England, for an awakened public health conscience and a sound public opinion are essential for the advance of preventive medicine. In many of our tropical possessions little more can be expected from the public than passive acquiescence in the proposals of the government; in some, more especially in those where education has proceeded along faulty lines and where isolation has led to that fatal feeling of complacency "we are the people and wisdom shall die with us," an active opposition is only too common.

Sir George Newman has written :—

" All wise government no doubt depends on the assent of the governed, but in public and private medicine an even fuller assent is needful, if the individual is to reap his full advantage, and at the same time act loyally as a member of the community. In fact, he is under obligation to cultivate his own health and capacity, and so to conduct himself as not to conduce to the hurt or risk of his neighbours. Hence the progress of Preventive Medicine depends in extraordinary degree upon the enlightenment and education of the people. There is no doubt that owing to the national system of education, to voluntary educational movements and societies, and to the valuable agency of the press and public opinion, such enlightenment is proceeding apace. Yet it has far to go."

This is written of England and Wales. When one thinks of how much farther enlightenment has to go in, let us say, the Punjab or Mauritius, is it any wonder that a feeling akin to despair sometimes fills the tropical hygienist? The remedy is to study the past, to appreciate the historical perspective. Then, as we trust has been shown, the future can as a rule be faced with a certain degree of courage and equanimity.

It is, of course, impossible to envisage all the advances likely to occur or even those which will certainly take place if no world cataclysm supervenes. We can but touch upon a few salient points at home and abroad, and try to indicate

how the different parts of the Empire may and should react one upon another. At the time of writing an Imperial Conference is assembled in London. Premiers and Governors are in conclave, and it is greatly to be hoped that amongst the problems considered those affecting the health of the Empire as a whole will receive attention. As a people we are too apt to forget that the success of trade depends very largely on the soundness and virility of the trader.

Taking first the homeland we find ourselves faced with questions relating to the Ministry of Health. In January, 1923, a highly suggestive paper by G. Lenthal Cheatle appeared in the *Nineteenth Century*. It was entitled "Ministers of Health—Defend Us!" and in the main was a plea for a medical Minister of Health. To tell the truth it was more a demand than a plea; the arguments used were forcible, and the tone was in places satirical. Apart from his chief contention the author pointed out some strange anomalies, as, for example, the fact that the Ministry of Health is actually concerned with the supervision of the behaviour of taxi-cab drivers and the place where they and their cabs can stand. Doubtless this is a relic of the days when the Local Government Board controlled horse-drawn cabs and their stands, as was but fit and proper when the fouling of the roadway by horse-dung and urine required attention. The present position is, however, absurd and the Ministry should be freed from this and other duties which have no bearing whatever on the public health. On the other hand its sway should be extended. We have already spoken of the need for its control in the case of the mercantile marine and, as Sir Lenthal Cheatle indicates, it should supervise the health of the school child and govern the relations existing between the diseases of animals and those of human beings. Organised research has been so successful under the ægis of the Privy Council, that it might be left there, especially as the Health Ministry has its own laboratories and has established a liaison with the Medical Research Council, but it seems curious that the medical inspection of factories and workshops should continue to be controlled by the Home Office. The responsibility for this most important work should certainly be transferred to and shared jointly by the Ministries of Health and Labour. All these strange ways of doing things, are of course, due to the fact that England is an old country, with stereotyped customs and an intense conservatism in administration. It takes time to effect changes even when most people recognise

the absurdity of existing conditions. That eventually the Ministry of Health will sweep into its net all the government services which deal with important health matters in England and Wales can hardly be doubted. The sooner this comes about the better, and Cheatle's paper ought to assist towards such a consummation. As to whether the Minister of Health should or should not be a medical man we can scarcely hazard an opinion. Cheatle's arguments appear sound and his view is shared by many. He lays special stress on the fact that the position of Lord Chancellor is always held by a lawyer, but does not recall the equally relevant facts that the Minister of War is rarely a soldier and that the First Lord of the Admiralty is invariably a civilian. Perhaps there is something to be said on the other side, unless indeed a medical man can be found who is well versed in politics, for our present constitution does not seem to have many niches for what we may call "specialist" Ministers. It seems to us, though we speak with diffidence on the subject, that the first thing to do, would be to alter parliamentary procedure and much of the present machinery of State, in such a way as to ensure that "specialist" Ministers would have full scope and not be hampered by political trammels. Then indeed a medical Minister of Health, free to concentrate on his duties and make the utmost of his great position, might render yeoman service to his country. At present he would be apt to wear himself out or break his heart, for the mental outlook of a medical man is usually very different from that of a lawyer and still more from that of a legal politician.

There is little doubt that the Ministry of Health will yet become, as it should be, one of the greatest of State Departments. Its Chief Medical Officer has indicated in no uncertain fashion the needs of the future and the part that the Ministry must play in catering for these needs. As cannot too often be stated, education plays a foremost part, not only education of the public in health matters but of the medical student, the medical, dental and veterinary practitioner, and the would-be public health specialist. Taking the laity first, there already exists a lay section of the Intelligence Division of the Ministry, but we venture to think this might with advantage be expanded in two directions. In this country there is a great need for a permanent museum of hygiene arranged on graphic lines, a truly educative museum, attractive, stimulating, up to date. It should be located in London, the centre of the Empire, and deal not only with home hygiene, but with

the hygiene of our overseas possessions. By paintings, drawings, diagrams, models and exhibits of all kinds, by special statistical displays, by graphic historical retrospects and by a careful system of labelling and informative type-script or printed matter the whole vast subject of health should be explained in all its bearings in an orderly manner. There would, indeed, be a huge, illustrated text-book on the walls. With little mental effort the visitor would grasp the truths presented and would realise what hygiene has done for him and his country. He could be made to understand any of the communicable diseases, for its history would be recounted, its distribution shown on maps and plans, its predisposing causes illustrated, its exciting cause, if known, exhibited either as a drawing or a culture. If an insect vector is operative a fine picture would display it, and the creature itself would be in evidence with perhaps an enlarged model to emphasise details. Not only so, but the relation of the organism to the vector would be graphically expounded. A display of the symptoms would present no difficulty. A temperature chart tells its own tale. It is easy for a good artist to paint a rash or a sore throat or a tumid belly. Actual specimens reinforced by plates and by paintings of microscopical preparations would reveal the pathology of the malady, the methods for its prevention would be made manifest by more illustrations, by a graphic exposition of statistics, by samples or models of apparatus used. The drugs employed in treatment would be shown, together with their botanical source if they are derived from the vegetable kingdom, and in some cases the whole process of their manufacture would be outlined. Such, in brief, is the method, and it is one with an extraordinary fascination for the man in the street. In the same way he could be made conversant with the details of house sanitation ; he could be taught how water is collected, stored, purified and delivered to the consumer ; he would see how milk comes to be supplied to him, and what happens to his dejecta. After a course of such a museum he would realise how he lives, moves and has his being, and recognise the nature of his disease foes, better than if he were to study a dozen books. Moreover, he would imbibe knowledge with a minimum of effort and a maximum of satisfaction. The prototype of such a museum already exists in London. It is restricted to the maladies and the hygiene of the tropics, but there is scarcely any limit to what could be accomplished in this direction, if funds were forthcoming. It would be

comparatively easy to create a Mecca for the devout hygienist of every race and land as well as for the ordinary citizen capable of taking an intelligent interest in his surroundings and welfare.

The citizen, however, must remember that his country is only one unit in a great Commonwealth. Hence his immediate surroundings, though naturally of most interest to him, should not exhaust his survey. He has responsibilities as a son of Empire, and he should be made to realise them. This would be a function of the tropical section of the museum. It is gratifying to know that at the forthcoming British Empire Exhibition, there will be a section, small, it is true, but fairly comprehensive, illustrating along enticing and graphic lines the medicine and hygiene of the tropics. Those who knew the British Board of Trade exhibit at Ghent in 1913 will remember that this display of tropical pathology and sanitation attracted far more visitors than any other part of the large exhibition there. It was thronged day after day by inquiring and interested crowds, mostly from Belgium itself. Yet Belgium possesses only one tropical colony and is concerned solely with Africa. Great Britain's tropical possessions form a belt round the globe and in them every kind of exotic malady is to be found, while they present countless problems in the hygiene of hot countries and show how such problems have been solved and are being solved or how they have defeated the sanitarian.

The museum, at least in a temporary form, is employed abroad for purposes of enlightenment. We have already mentioned Ceylon, and the Colonial Mutual Life Assurance Society of Australia makes a point of staging health exhibits at bazaars, carnivals and other gatherings where people congregate. As we shall see, the graphic museum has also come to stay in some of our tropical possessions. There should be a great and useful future for it.

The other directions in which the citizen might be aided is by the provision of a type of literature, which has recently been developed in the United States. The attractive magazine known as *Hygeia* has, so far, no counterpart in this country. It is true that some of our lay journals, as, for example, the *Empire Review*, deal with health problems, but such periodicals appeal only to a limited, if important, class. *Hygeia*, however, is designed to lure every one to its pages and illustrations. It caters for the child and for the adult, and shows how health questions can be made interesting and even entertaining.

Pamphlets are thrown aside, lectures and films are

forgotten, but a museum is an abiding force in education, and a journal like *Hygeia* supplements its teachings.

In every number of such a publication, there might well be a reminder like that issued by the Federal Public Health Service of the United States. This takes the form of leaflets which ask, "What does the Public Health Service do for me?" and give a succinct account of the varied activities of the department.

This kind of thing, let it be noted, is very different from the indiscriminate public propaganda which Sir Arthur Newsholme mentioned but to condemn in his valuable address, "Things that matter in Public Health." As he very truly remarks, the best health educational work is done by school teachers, health visitors, tuberculosis visitors and sanitary inspectors, and it is better to concentrate on their training and "to fight strenuously against penurious curtailment of their work," than to try to make every one into a kind of Public Health Pundit. There is, however, a difference between attempts to instruct and efforts to interest. Doubtless *Hygeia* does both, but the instruction is imbibed more or less unconsciously. It is true that in education there is nothing like the personal touch, but even the best teacher cannot always invest his subject with the same charm as can a skilled writer, trained to the task, and with that gift of holding the reader's attention which means so much in these tempestuous days. Remember also, as Miss Cooper Hodgson recently said, that "the only health literature read by the majority of the dwellers in the little back streets, those scenes of perpetual searing tragedies of premature death, is patent, medicine advertisements."

The museum would naturally be planned to serve the medical man as well as the layman and might work in accord with the medical Intelligence Division of the Ministry, which, of course, is constantly at work. For all that, many medical men have but a hazy idea of what the Ministry of Health accomplishes and an occasional reminder on American lines would do no harm and might do good. "So let your light shine before men," says Holy Writ, and this would not be a bad motto for the Ministry, and need not in any way savour of advertisement.

A monthly journal like *Health*, which is issued by the Commonwealth Department of Health in Australia, might be very helpful if well edited and pleasantly written. The busy brain dislikes strain and the tired brain finds it hard to

concentrate. The medical man, whatever his line of work may be, usually calls freely on his store of nervous energy. Hence the lighter his reading can be made the better, provided the matter is forthcoming.

That the British Health Ministry keeps a watchful eye on the future is evident from a perusal of the Annual Reports of its Chief Medical Officer. In the first part of this book we mentioned Sir George Newman's views on the necessity of directing the attention of the medical student throughout the whole period of his studies to the preventive aspect of medicine. Such training would be given not merely for academic purposes or solely to impress the importance of prophylaxis on the plastic mind of the student, but with the object of furnishing the State with a body of practitioners who would be the unofficial but none the less effective assistants of the Ministry of Health. We have seen that in South Africa a similar idea has been mooted, and it is significant that at Gaya in India, a place notorious for its cholera prevalence, the District Board has framed a scheme of "intensive rural sanitation," one feature of which is that it combines medical dispensary (not private) practice with a study of the local sanitary conditions and measures that could best be employed for their improvement. The *Indian Medical Gazette* of September, 1923, commends the scheme in this particular, pointing out that in India there is too little contact between medical and sanitary departments.

On the other hand, in the United Kingdom we must look forward to the day when part-time Medical Officers of Health cease to exist. It is one thing for the medical practitioner in his private capacity to preach the gospel of health, as did the great Dr. Gregory, when he thrust his gold-headed cane through the glass of a closed window in a stuffy bedroom; it is one thing for him to keep his eyes open for sanitary defects, and devote some of his trained intelligence to the service of his country; but it is quite another to expect the majority of part-time Medical Officers of Health to be as efficient hygienists as their whole-time colleagues. "No man can serve two masters," at least to the entire satisfaction of both, and the public health is so important a matter that its interests should not be allowed to clash with those of the individual. Economy may be purchased at too high a price.¹

¹ There is, of course, another side to the question, for under certain conditions the personality and professional repute of the part-time man may count for a great deal, especially perhaps in rural districts.

There will be plenty for the private practitioner to do if the vision of preventive medicine vouchsafed to Dr. John Dill Robertson of Chicago is ever realised as a working proposition. He charges the general practitioner with criminal negligence in the hope that his message will prove so irritating that it will stimulate him to a sense of his responsibilities as a guardian of the public health in his own special direction. It is, of course, true that if we can prevent the manufacture of foci of infection—no matter what the type of communicable disease may be—we are helping the community. This, according to Robertson, is the true function of the private practitioner—not to cure the sick, but so to advise his patients, or rather his clients, that they will remain in good health. After all, it is to all intents and purposes the old Chinese method, whereby the doctor is paid so long as his patients are well, and has to attend them for nothing when they are ill. Dr. Robertson's message is :—

“Go to your office to-morrow morning, take down your record and find how many people there are for whom you are the family physician. Take those that have been to your office during the past year; write them a letter; tell them you would like to have them drop into your office, that you would like to talk to them . . . and sell them the idea of health. . . . Tell them that they should have a thorough physical examination . . . and when you make this examination, make an examination that will impress them, not a careless one, not a stick-out-your-tongue-let-me-feel-your-pulse examination, but an examination that they will talk about . . . an examination from head to foot . . . ; and when you get all through with your instructions and with your examination, then you are ready to have them sign up with you for a continual, continuous audit of their physical banking account.”

He would seem to have improved on the Chinese method, at least from the doctor's point of view, if there is any truth in his concluding prophecy :—

“When you have 600 patients (the number of individuals in Chicago to each physician), signed up you will be amazed at the fact that your income has doubled and trebled in the course of a year.”

It is sage advice, and if Sir George Newman's plea is acted upon we may yet see such a type of medical practice. Already, indeed, there is a move in this direction, so far as Life Insurance Companies are concerned. It is certainly better that the individualistic aspect of public health should be the affair of

the general practitioner and the Insurance Companies rather than that of the State, for in the latter case there is undoubtedly a risk of undue expenditure and a tendency to forget that, on the large scale—the scale on which the State operates or should operate—the environment is more important than the individual. This view has been argued somewhat polemically but withal ingeniously by Professor Wynne of Sheffield yet it would seem that, until the general practitioner is in a position to assume the rôle of a health mentor, having been trained to appreciate the value of prevention, the State must exercise in some degree control of the health of the individual, as for example in the case of the school child. At the same time any attempt to dry-nurse the nation deserves no encouragement. Personal responsibility is a factor making for virility, and it should never be superseded.

Cancer is one of the great killing diseases in this country, and it is coming more and more to be viewed from the hygienic aspect. We cannot here discuss its possible relationship to food, its association in certain forms with certain industries, the question of hereditary transmission, and so forth, but no outlook on the public health would be satisfactory, which did not at least direct attention to the very active research which is being prosecuted into the ætiology of the disease and the new fields of work which the British Empire Cancer Campaign proposes to explore. That the Health Ministry is fully alive to the importance of cancer is shown by the issue of its comprehensive Memorandum on the disease.

A special feature of Sir George Newman's last report is his insistence on the need of paying attention to Minor Diseases, of preventing the neglect of such maladies as dental caries, oral sepsis, habitual constipation, common colds so-called, dyspepsia, measles, or discharging ears. This is just as true of the tropics as of this country. One is apt to forget the part that the ordinary illnesses of everyday life play in tropical pathology. Pneumonia is a very deadly disease in many hot countries and it not infrequently begins as a nasal catarrh. Septic foci may be followed there, just as here, by rheumatism and organic heart disease.¹ One form of infection, not mentioned by Newman, which perhaps plays a more significant rôle in this country than is generally attributed to it, and is certainly a factor which must be seriously reckoned with abroad is worm infestation. We do not mean great

¹ The great importance of the Rheumatic Diseases in this country is emphasised in a recent Report (No. 23) of the Ministry of Health.

infections like ancylostomiasis and schistosomiasis, but rather the harbouring of the common round-worms, thread-worms, whip-worms and so forth, the rôle of which in causing inefficiency and disease is yearly becoming more manifest. In Australia hydatid disease requires special attention, and probably throughout the tropics several of the tape-worms are more important factors than has hitherto been recognised.

In the case of all these maladies research is still required, and what it can accomplish is shown in the case of measles, for it was the investigation of the principles of immunity which led to the prophylactic use of the sera of convalescents. This method has been little employed in England, but on the Continent it appears to have given very satisfactory results. It certainly merits careful investigation with the view not only of determining its real value, but of improving the somewhat crude process at present followed. There is no saying where such an inquiry might lead, for a similar procedure has been introduced in whooping-cough and scarlet fever, and is said to be promising.

Research, however, and still more the application of research, requires more freedom from the attacks made upon it by fanatics, cranks and busybodies. It is absurd that persons of this kind should be permitted to interfere with the progress of the world. Heiser in his paper "The Menace of the Unvaccinated," with feelings stirred by the heavy losses due to small-pox amongst unvaccinated communities in the United States, recently wrote as follows :—

" I believe that the cause of health would be more effectively served if, in the future, health officers would take the offensive instead of remaining on the defensive. Think of the endless time that is consumed by the profession every year in defending itself against the attacks of the antivaccinationists, antivivisectionists and others. A little more educational effort directed towards legislative bodies would serve to demonstrate that these attacks are endangering the very life of the nation, and legislation should be insisted on which would render propaganda inert. If health officers and the medical profession are faithfully to discharge their obligations to the public, they must be allowed more time to carry out constructive measures, instead of constantly wasting their time in defending themselves. The wanton destruction of life by the actions of those who ignorantly oppose well-authenticated facts must not be tolerated in the future."

To this we would append the single word " Amen ! "

Education and research are to be combined in the new School of Hygiene and Tropical Medicine, the gift of the Rockefeller Foundation to the British nation. It is to be established in London, will co-ordinate all the ordinary instruction in public health given in the metropolis, and will absorb the London School of Tropical Medicine. This, however, is only part of its functions, for the scope of public health training is to be extended. There will be courses not only of chemistry but of bio-chemistry and of physiology as applied to hygiene, not only of bacteriology but of immunology, which should be taught in a practical manner, full use being made of laboratories where sera are produced on a big scale. It is very necessary that in the future the State should have at its disposal men thoroughly versed both in the principles and practice of immunology if only because it is certain sooner or later to exercise control over the manufacture of sera, so far at least as questions of standardisation go. In this direction we are being outstripped by the United States and other countries. At present epidemiology forms a very minor section of public health training. In the new School of Hygiene it is intended to give it a foremost place and it will be linked with the study of vital statistics and of climatology. From the imperial standpoint, the most significant development is the absorption of the London School of Tropical Medicine, but it is to be hoped that, despite such absorption, the Mansonian tradition will be fully maintained. The union will entail the teaching of the hygiene of the tropics alongside that of the homeland. This is as it should be, for it is merely in detail and in application that the two differ, and each has useful lessons for the other. Opportunity should be taken to train not only Medical Officers of Health, but Sanitary Inspectors destined for work in the tropics,¹ and one of us has shown elsewhere how many facilities exist for their instruction in and around London. In yet another paper he wrote as follows :—

" If it can only be arranged, I think it would be an excellent thing to have attached to the Imperial School of Hygiene a small band of advisers whose duty it would be to proceed abroad at intervals and to help those responsible for medical and sanitary work in all parts of the British tropics. I am quite sure from what I have seen and heard that such men, if of the right stamp, would receive a hearty welcome." Not only could they render

¹ Unless such instruction can be furnished by the Royal Sanitary Institute, which at present only *examines* inspectors professing tropical hygiene.

signal aid to many an administrative officer, to many a clinician, to many a laboratory worker, to many a sanitary inspector, toiling far from those resources which we have at hand, but they could gather a great deal of valuable information as to the conditions prevailing in, and the needs of the places they visit.

"Moreover, they would bring to bear upon the local problems that freshness of outlook to which I have already alluded and which is so valuable, and they might inspire and encourage those whose lot is cast in the less pleasant places of the earth. I can imagine no more useful type of medical mission and no mission so far removed from the ordinary kind of inspection which too often tends to be carping and critical. It is that personal touch which in matters general has recently been extended to the West Indies and which has been so greatly appreciated and cannot fail to be of the greatest service."

It is work of this kind which would make the school truly imperial in nature. It seems to us that there is here a fine opportunity for extending a helping hand to those possessions whose sanitary trials and troubles we have endeavoured to depict. Not only so, but the great graphic museum of which we have spoken might be located in this school, and arrangements might also be made to aid research workers coming from abroad, more especially from the tropics, where even a good man may find himself at a loss and be forced to lay aside or abandon a promising inquiry for lack of encouragement and advice. Many would welcome the chance of bringing their material to such a centre and completing there, in the best surroundings, observations begun and continued under all kinds of difficulties. Only those who have lived and laboured between Cancer and Capricorn realise what all this means. If the School of Hygiene is conceived in a parochial spirit and proceeds merely on limited lines a wonderful chance will be lost. English public health, great and worthy though it be, the founder and leader of all modern hygiene, is but the centre of a vast organisation. This organisation, however, is loosely knit. The association of the centre with the rest is rather historical than practical, save in a few special directions. It cannot well be otherwise for, as we have seen, hygiene in some of our overseas possessions is still more or less rudimentary, and moreover, in many of them there are problems which have no parallel in this country. But, the governing principles being the same, there is urgent need for some co-ordinating centre and that centre should be the new School, the welcome gift of a land which has adopted the English

tradition of public health work and has achieved wonders in its practice.

Lastly, the history of public health should be taught at the School. We have written in vain if the reader has not grasped the importance of the historical perspective in the study of hygiene. The present generation of citizens in this country exists amongst sanitary surroundings. They take their clean streets, their pure water, their cleanly and efficient sewage disposal, their conveniences and public health privileges as a matter of course. They do not realise that these things have been earned, and hardly earned, by the pioneers; they never imagine that if the machinery were suddenly to stop they would be face to face with tragedy in less than a month. Yet Russia could have taught them the lesson not long ago. It is, however, simpler and more effective to point the moral from the annals of one's own country and not the least stimulating and useful course in the school might be that devoted to the History of Hygiene.

The various sections of the Medical Department of the Ministry of Health are listed as follows: 1. General Health and Epidemiology; 2. Maternity and Child Welfare; 3. Tuberculosis and Venereal Disease; 4. The Supervision of Food Supplies; 5. General Practitioner Services, largely concerned with Insurance Medical Service; 6. Sanitary Administration in relation to infectious Disease; 7. Welsh Board of Health.

As already noted, Scotland has a Board of Health, a most efficient body, which functions like the English Ministry, while Ireland has a Public Health Council. At the present moment it looks as if Ireland would appoint a Ministry of Health and so realise another national aspiration.

Now as regards the above sections the only one to which we would here direct attention is number six, and that only because in surveying the future it is clear that greater and still greater efforts will be made to nip, as it were, communicable disease in the bud. Prompt action means half the battle. Strike early, strike quickly, and strike hard must ever be the motto. If this is true of conditions in England, it is still more true of those abroad where, however, in many places it is easier to preach the doctrine of prompt action than to put it into practice. Still what can be done was shown in Egypt, where under the section of Epidemic Services there existed mobile units which were wont to proceed post-haste to any place threatened with cholera, typhus or plague. Again and

again these useful skirmishers checked and limited the enemy attack. The onset of epidemic disease is like the rush of waves breaching a sea-wall. The early damage can easily be repaired and the danger averted, but unless an immediate and adequate defence is forthcoming the gap widens and what was a simple task becomes either a costly business or an impossibility, and one has to struggle and strive until the storm abates and the full extent of the calamity is apparent.

Happily in this country, both inland and at our ports, the health police are ever on the watch, and practically at a moment's notice reinforcements can be rushed to the spot, and can be trusted to save the situation in the great majority of cases. The number of acute communicable diseases which still baffle the hygienist is fortunately inconsiderable, though amongst them is influenza.

We cannot, however, afford to rely on such emergency measures. They are wasteful and exhausting. The incidence of disease is largely determined by environment and this must steadily be improved wherever it is faulty. Undoubtedly the most pressing question of the day, at least in almost every urban area of the British Empire, is that of housing. Speaking generally, people take tone from their surroundings. It is the old story of the pig and the pigsty. Keep a pig in a filthy pen and it will be a filthy animal, mired with dung and dirt, an object of disgust. Give it a clean run, plenty of air and light and decent feeding conditions, and it becomes a different creature. Slums and slum dwellings beget crime and disease. The housing problem is bound up with questions of industry and poverty. These are matters much too large and complicated to receive attention here even if we only think of them in their relation to the public health. As regards the former we would only recall the dictum of Ramozzini who, so long ago as 1700, wrote: "'Tis a sordid Profit that's accompany'd with the Destruction of Health." The latter is likely to be always with us, at least while we continue to spend huge sums annually on alcoholic beverages and ignore the Golden Rule. Still the campaign against disease is in itself a species of warfare against poverty and destitution. We have already seen that it is a sound investment and undoubtedly, as sickness lessens, shekels will increase, and increase where they are chiefly required, that is, amongst the labouring classes. Hygiene is not a panacea against all the ills to which flesh is heir but it is certainly one of the greatest benefactors of mankind, at least under existing conditions.

When this country was rich we neglected the housing problem. Now that we are poor it appears insoluble and one of its most important aspects, the restriction of the number of houses to the acre, remains to all intents and purposes a vain dream.

Yet there have been remarkable developments in this country, as witness the Bournville of Cadbury, and the Port Sunlight scheme initiated by Lord Leverhulme. Whatever we may think about Mr. Keir Hardie and his views let us remember that in 1911 he remarked :—

“What I have to say about Bournville is that if we could compel our local authorities to follow where private enterprise has led, we should speedily eradicate slumdom, and with slumdom many of the evils which follow in its train, especially the great white scourge, consumption. We should make it impossible for either long hours or low wages to be continued. Give a man and his wife and children a decent little home to live in, a bit of garden to cultivate, and opportunities for work and recreation, and he will insist upon having both the time and the means to enjoy these privillges.”

He was right, but local authorities have so far done little in this direction. The Corporate Body still leads the way, and this would appear to be especially the case in Australia, judging from a paper by Woodland, Director of the Department of Welfare Service, Colonial Mutual Life Assurance Society, Melbourne.

He gives some interesting examples in *Health* for July, 1923, of the activities of corporate bodies in that Commonwealth and cites particularly the efforts of the British-Australasian Tobacco Company to conserve the health of its workers. It has framed a building scheme on the lines of the *crédit foncier* system, regarding which he writes :—

“A deposit of 5 per cent. is required to be put up by each participant, the balance being advanced by the company at 3½ per cent. per annum (3 per cent. prior to January, 1919). Repayments are spread over optional periods, ranging from 21 to 28 years, according to the table chosen by the participant, or the total sum may be paid earlier if desired. Table No. 1, which is by far the most popular, calls for repayments of 2s. 3d. per week for each £100 borrowed, over approximately 28 years, which amount covers both interest and sinking fund. Repayments are required for 50 weeks only in the year, no payment being made for the remaining two weeks.”

It is along these lines that we may look for progress in the future and it is satisfactory to know that some of those who control the destinies of the country are alive to this fact.

There are many other problems in the public health of this country, and of the great self-governing Dominions which any outlook on the future should embrace. We can only list a few of them, such as the need for new regulations regarding the registration of births, deaths and still-births, the necessity for national action in connection with bovine tuberculosis and the provision of a pure milk supply, the extension of maternity and child-welfare work, more especially in the direction of imparting knowledge on elementary mothercraft in the schools, the development of the campaign against smoke abatement, the improved protection of food-stuffs exposed for sale, and the question of whether the general campaign against dirt and disease is to be pressed along the line of education or that of compulsion. Long ago experience in dispensary and club practice led us to think that one of the greatest benefits which could be conferred on the suffering poor would be the provision of what we may call houses of rest. How often have we seen some wretched, poverty-stricken creature come for examination and advice, wheezing with bronchitis or racked with lumbago! What use was a free bottle of medicine, a plaster or a liniment to such an unfortunate? He needed a comfortable lodging for a few days, warmth, decent food, and perhaps a pair of sound boots. Such could not be given him, and wearily he had to trudge through slush and bitter wind, to some miserable fireless room where amongst dirt and squalor his malady ran its course. There is no hospital for such people and they are not ill enough to be sent to a workhouse infirmary. Medicine and advice are largely wasted upon them. True, a Salvation Army shelter may afford them harbourage, but some of them are dangers to others as well as to themselves and should be housed in rather a special way. It seems a pity that nothing is done for them even if many are mere flotsam and jetsam. Doubtless rest-houses of the type suggested might be abused but, if properly managed and arranged, they would be of real value in checking the spread of common colds and other infectious minor maladies. We admit that at the present time, even if charitable aid were forthcoming, funds could not possibly be found for such a purpose. It is true also that it would be better to go to the root of the matter and improve the actual dwelling-place, but a long period must elapse before any radical and extensive

change in housing conditions can be brought about, and in the meantime shelters of the type we indicate would be a great boon to many poor people and would play a not inconspicuous part in safeguarding the public health of a certain section of the community.

Let us turn now for a moment to another aspect of hygiene as it affects this country, one of comparatively recent growth but which is likely to have a great future before it and which to some extent concerns the Empire as a whole. We refer to the participation of Great Britain in public health schemes of an international character. From the point of view with which we are here concerned, Sir George Newman has dealt with the subject in such a concise yet comprehensive manner in his Report for 1922, that we feel we cannot do better than transcribe his utterances. He writes as follows :—

“ The establishment of the Ministry of Health was not only coincidental with notable developments in the central public health organisation of different countries abroad, but also gave a strong impetus to the revival and expansion of the activities of the Office International d’Hygiène Publique established at Paris under the Convention of Rome of 1907, and to the creation of a new centre for international health action under the League of Nations, a provisional Health Committee, together with a Health section of the Secretariat having been appointed in 1921.

“ Before referring to the work of these international organisations for the health of the world generally, I may point out that even from a narrower or insular standpoint they have already, both directly and indirectly, proved advantageous to British public health work: (a) Indirectly they have had the great advantage of necessarily bringing the medical officers of the Ministry into closer personal touch with their colleagues in foreign countries, as well as of the British Dominions and Colonies, India and Egypt, and thus have led to the giving of mutual aid and to helpful discussions on many branches of public health work where experience from overseas is needed for our guidance or our own experience is asked for. (b) More directly, much benefit has been derived from the considerable output of the two international offices referred to. They provide means by which official public health opinion can be focused, and, where necessary, embodied in agreements, on practical procedures of world-wide interest such as the prevention of the spread of serious epidemics from pestilence-stricken regions, quarantine rules, and the like. (c) They also afford means by which knowledge, hardly to be secured in any other way, can be obtained to facilitate the study of different factors of disease and methods

of disease prevention. The problems of cancer, encephalitis lethargica, goitre, and other diseases which I have mentioned above in the section of epidemiology, are now all receiving light from work concerted by the international health offices. (d) Finally, these offices fulfil a valuable function, which, it is hoped, will be further developed under future international conventions, for the rapid distribution of intelligence about epidemic diseases for the purposes of day to day public health administration at ports and frontiers."

There is no saying whither work of this kind may eventually lead. Already in the case of the League of Nations it has directed attention to the prevalence of tuberculosis and sleeping sickness in equatorial Africa, the adequacy of the measures taken for their control and the necessity for international co-operation in dealing with the latter disease.

The mention of Africa reminds us that there is an outlook as regards our tropical possessions. So far this has been mentioned merely incidentally, but it must now claim a share of attention. The future of health conditions in the Navy, the Mercantile Marine and the Army has perhaps been sufficiently indicated in the chapters dealing with them. In the Navy and Army at least there are definite and efficient Medical Services which can at this time of day be relied upon to safeguard the health of their respective personnels, to keep abreast of the advances which are made in the Science and Practice of Hygiene and even to initiate such advances.¹

It is quite otherwise with our Crown Colonies, Protectorates and those countries for which mandatory powers were allotted to Great Britain under the provisions of the Treaty of Versailles.

Each country has its own form of administration or government, the different territories in this connection being arranged in groups. Thus some have an elected House of Assembly and a nominated Legislative Council, some have a partly elected Legislative Council, others have a Legislative Council nominated by the Crown, yet others have no Legislative Council. We need not enter into details, though the outlook as regards public health does undoubtedly differ to some extent according to the type of administration in force.

The point to which we here specially desire to direct attention is the fact that there is no Colonial Medical Service comparable to that of the Army, the Navy or the Indian Medical Service. There has, however, been one notable and successful attempt at co-ordination, namely in the case of the

¹ The same is, of course, true as regards the Air Service which, despite its youth, has some valuable research work to its credit.

West African Medical Service, while there is a tendency in the same direction with respect to the East Coast territories. The question of a Colonial Medical Service is a very difficult one, for the situation possesses special features which are not presented by the above-mentioned Services. In each Colony or Protectorate there is a Director of Medical and Health Services or a Principal Medical Officer—the titles vary somewhat. He, like all the other government officials, is under the Governor, who is himself responsible to the Secretary of State. If a Colonial Medical Service covering all the different groups of possessions were instituted there would have to be a medical Director-General at the Colonial Office, and the aforesaid Principal Medical Officers would be under his jurisdiction, at least so far as medical and sanitary matters are concerned. Such an arrangement might lead to difficulties with the Governors, for it would introduce a disciplinary factor to which they are not accustomed, of which they have no experience, and concerning which they are possibly somewhat suspicious. It would appear that this is one reason why such a policy is not regarded with favour. The idea itself is not by any means a new one. Many years ago, in 1896, to be precise, Sir George Evatt suggested a scheme of reform which included the formation of a Colonial Medical Service, but his proposals were relegated to the limbo of forgotten things, and it was not until 1920 that the subject received serious consideration. In that year was published the Report of the Departmental Committee appointed to inquire into the Colonial Medical Services. This Committee owed its being to the fact that after the war there was a great deal of unrest and dissatisfaction throughout the Colonial Medical Services, and more especially in Kenya and Uganda. Representations were made to the Colonial Office from several quarters and as a result the committee was appointed. Its report considered the creation of a unified service but, while admitting that it was the ideal to be aimed at, decided that its full attainment was at that time impossible. There can be no doubt that this was a wise finding, for the conditions differ so much in the various colonies that it would not be practicable to bridge the existing gulfs. It was suggested that this opinion should be reviewed in five years' time. Hence in 1925 the time should be ripe for a further discussion.

It is to be hoped that this will be borne in mind, for the scheme might well be carried through piecemeal, whereas if it is put aside for an indefinite period no progress will be made.

The advantages of such a unified Service were listed as follows :—

- “ (a) It would constitute a recognition of the Colonial Medical Service as a distinct branch of the public medical service of the Empire.
- “ (b) The status of the Service in the opinion of the medical profession would be enhanced.
- “ (c) The young medical man when asked, as he often is, ‘What are you going in for?’ would be provided with a brief reply, carrying a definite meaning—viz., ‘The Colonial Medical Service.’
- “ (d) The above considerations would tend to encourage recruiting.
- “ (e) Questions at issue affecting the interests of a unit of the Colonial Medical Service would be settled with much less display of feeling if those concerned knew that they had been submitted to a man of standing in their own profession.
- “ (f) Possibly the most immediate and obvious advantage would be that throughout the Service it would be regarded as an attempt to provide them “with an adequate channel through which to express any feelings of discontent which may arise at any time.”

It was proposed that there should be a Director-General, but his duties, as defined, were rather those of an Adviser-General. We need not pursue this recommendation further for, as stated, it is not one which has commended itself, and though some day it may be acted upon, the immediate future will certainly not witness its acceptance.

Perhaps the most important finding of the committee was the recognition of the necessity for the appointment of “Inspectors of Medical Services.” These are the same type of officials as those mentioned in connection with the overseas work of the Imperial School of Hygiene, though presumably, as they would emanate from the Colonial Office, they would be endowed with powers which the merely scientific advisers would not possess. Inspector is perhaps not a good name. It suggests espionage. Doubtless there would be inspection duty but, to be of any real value, it would have to be combined with advisory and generally helpful functions. So far no post of this kind has been created although, as will be remembered, Ross pleaded for it in 1901, when he was studying malaria on the African West Coast. The system, however, is bound to be instituted sooner or later and forerunners have not been

lacking in the form of visits paid by tropical experts, as, for example, Professor Simpson. The other provisions of the Report, which was on the whole a wise and far-seeing document, scarcely call for comment here, except perhaps those which deal with study leave, transfers, the establishment of reference libraries, and the encouragement of research. All these are matters of high importance, but it is to be feared that little has been accomplished since 1920 to give effect to them, except, perhaps, as regards research, which always receives sympathetic consideration by the Colonial Office. It has been a difficult period, for local funds have been at a low ebb in many of the colonies and the British Treasury has had to practice rigid economy. Moreover, it has not been at all easy to fill the gaps left by the war, and the new posts rendered necessary by the natural expansion of growing territories like those in Africa and Malaya. The outlook, however, is promising, for in many directions the Colonial Medical Services, at least in the more important territories, have been improved, and they now offer an excellent career for men who wish to take up this line of work. Little has yet been done in the way of forming auxiliary medical service in Africa like those existing in India, Ceylon, Malaya and Fiji, but a beginning has been made, and in a country like Uganda where, thanks to the qualities of its inhabitants and missionary efforts in the past, good raw material is available, the next decennium should witness a notable development in this direction. Doubtless it will also see a considerable increase in the number of trained British sanitary inspectors, many of whom will have qualified in tropical hygiene. These men form the backbone of sanitation in our tropical possessions. There are good, well-educated native inspectors here and there, but very rarely do they possess the energy and driving-power of the white inspector. They often work admirably under him, however, and he forms a most useful link between them and the Medical Officer of Health. One of us has dealt elsewhere¹ with the British Sanitary Inspector, his duties, and his value to the State, and we need here say little more than that he is specially required in some of the West Indian islands, where a fine field of work awaits him.

He must, however, no matter where he may happen to be, carry out other duties than those of mere inspection and reporting. He should try by every means in his power to elicit the interest of the people with whom he deals and to

¹ *Journal, Royal Sanitary Institute*, Vol. XLIII., No. 7, 1923.

excite their sympathy with his activities. If he lets a little humour creep into his work, so much the better. The Inspector should be an educative factor of considerable importance.

As we have repeatedly said, education is really the crux of the whole situation in the tropics, and we hope to see the day when graphic museums will play a great rôle in imparting information. They exist already in embryo form at Calcutta, Zanzibar, and Dar-es-Salaam. It is true that a certain degree of enthusiasm is required to get them begun, and considerable driving force is needed to keep them going, for they must be up to date. A live museum is a vital force, a moribund museum is a tragic failure. They can be run fairly cheaply, and if there was a great Central Institute in England to guide, advise and help them expenses would be distributed and fall less heavily on local coffers. In places like the West Indies museums of this kind might be made to serve another purpose than that of pure instruction. They could be usefully employed to excite healthy rivalry. Show one parish how another is outstripping it in sanitary efficiency, fan the flame of emulation, and there will be a quickening of dry bones and an infusion of energy which cannot be anything but beneficial if due tact and discretion are displayed in the attempt.

It is never safe to assume the prophet's mantle although prophets may, we know, be accorded honour in certain places, but after our bird's-eye view of public health activities in the Empire we cannot but feel that the future holds much of promise, that the outlook is auspicious. A stage has been reached in the history of the British Commonwealth where the principles of Hygiene have received, from those who really count, the adherence to which they are entitled. In the homeland and the great self-governing Dominions the car of the goddess Hygeia is making a progress wellnigh triumphal, although obstacles still lie in the path. In the Colonies and Protectorates light is spreading, slowly it is true, but in most places surely, amongst the native populations, and a great band of men and women are doing their utmost to dispel the clouds of ignorance, prejudice and superstition. There are laymen and laywomen in this company and they may be of good cheer, for they can recall the facts that the greatest research worker of all time—Louis Pasteur—was not a physician, and that Edwin Chadwick, the foremost pioneer of sanitation, was not qualified in medicine. All can help in

the campaign and they will help to the best purpose, if they bear constantly in mind that what is chiefly required at the present moment is application of our existing knowledge. It is a long time since Ray Lankester affirmed that if we could only apply our present knowledge properly all communicable disease could be stamped out in the short course of fifty years. There was truth in what he said, though he was somewhat of an optimist. Part of the fifty years has already passed, and the World War has set the clock back, but the machinery is once more in motion and is gaining power and momentum. No such crusade under the banner of Health has ever been witnessed as that which is being prosecuted at the present time in wellnigh every portion of the British Empire.

It cannot fail of its effect, but that effect will never be fully realised unless at times the workers halt and look backward for a space, reflecting on what has been accomplished by those who led the way, and paying homage to the memory of the pioneers.

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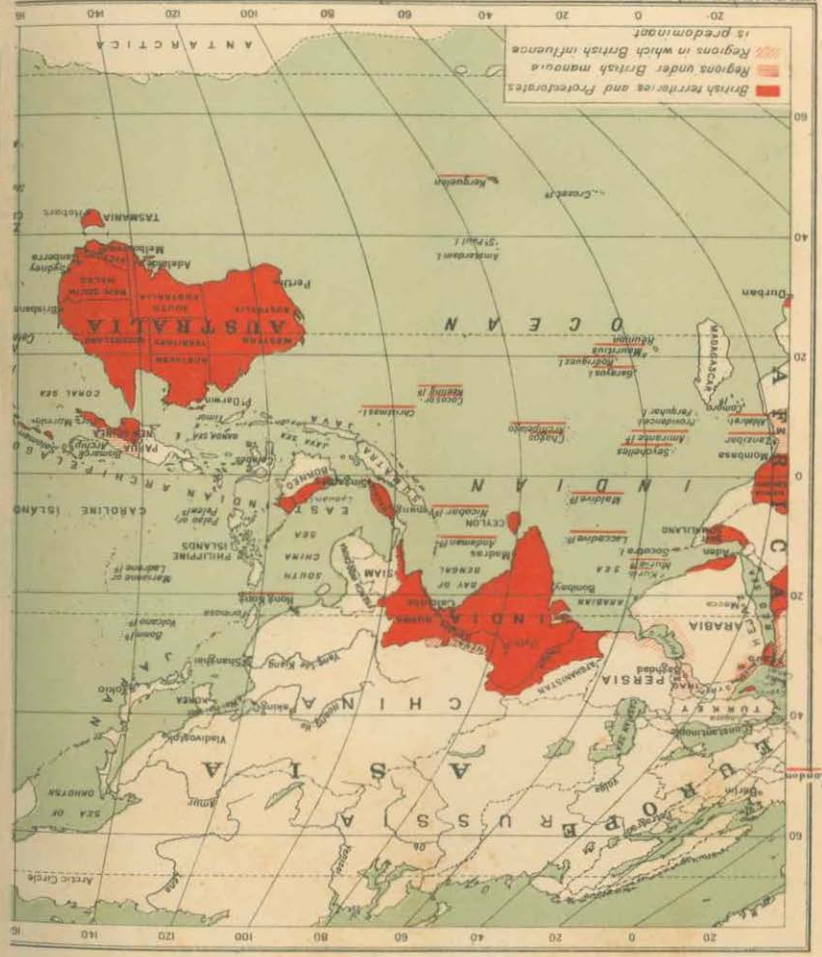
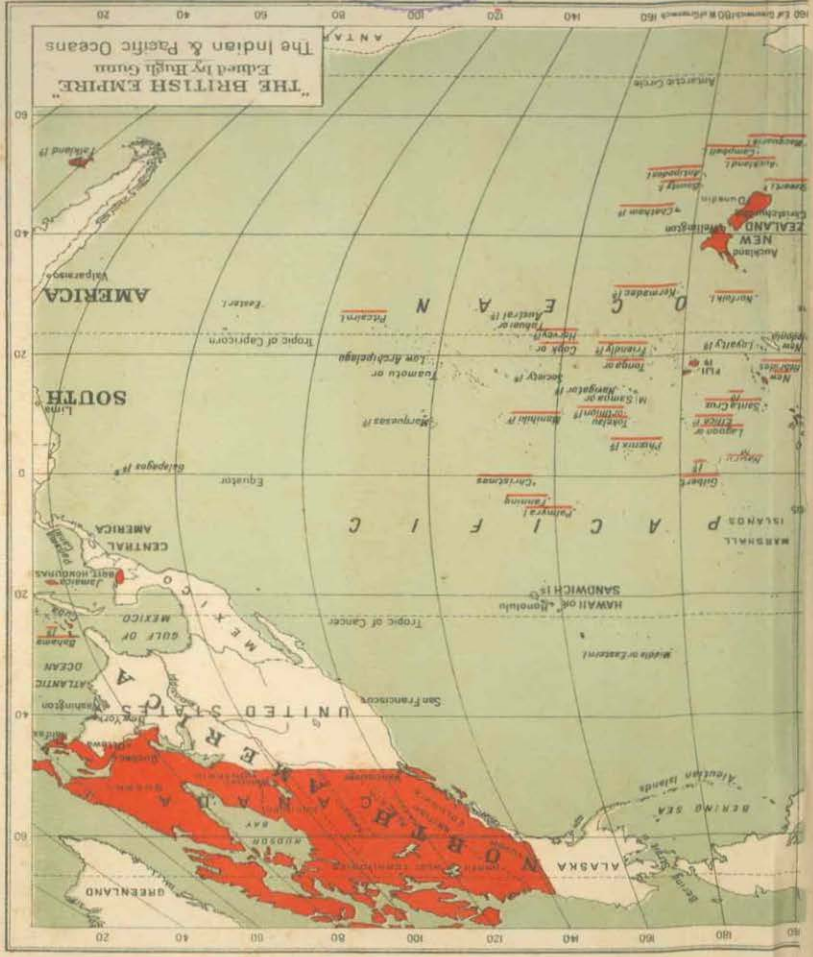
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