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# CHAPTER I.

## INTRODUCTORY.

Period covered by the report.

At the time that the preparation of this narrative was begun it was hoped that the epidemic of plague which had almost died out in the Bombay Presidency would soon completely disappear. Unfortunately this hope was not realized. With the rainy season a recrudescence of the disease began, which spread and increased with alarming rapidity. The present account deals mainly with the first period of the epidemic, which lasted, roughly, from August 1896 to July 1897, and although some observations have been recorded on the progress of the recrudescence and the further measures adopted on its occurrence, the subsequent history of the plague will have to be examined in another report and at a later date.

Main object.

The main object of the report is to furnish an account of the epidemic, of the conclusions arrived at with regard to the nature of the disease and of the measures best calculated to check and to stay it, and of the operations that have been carried out in the Bombay Presidency and elsewhere with this view. It appeared to the Government of India that a narrative of the measures adopted at different places and under different conditions, and of the results following on the measures, would serve as a useful guide for future occasions, should such a guide unfortunately be needed. As a main object of the report is to serve as a work of reference, the account of the remedial and preventive measures has been given in considerable detail.

Causes and characteristics of plague.

Chapter II of the report deals with the causes and characteristics of plague with special reference to the observations recorded by the most qualified observers during the present epidemic. Particular attention is paid to those portions of the subject which throw light on the manner in which the disease is spread and the direction in which the efforts to combat it are most likely to be successful.

History of plague.

Chapters III to V deal with the history of plague. In Chapter III a brief account is given of the general history and geographical distribution of the disease. The previous history of plague in India is

described in greater detail in Chapter IV, and Chapter V contains a short history of the course and extent of the present epidemic.

**Remedial and preventive measures.**

**Measures adopted in plague centres.**

The next portion of the report deals with the remedial and preventive measures. Chapter VI gives a general account of the measures. Chapters VII to IX deal with the measures adopted in the plague centres themselves, separate chapters being devoted to the City of Bombay, to the remainder of the Bombay Presidency and Sind, and to places outside the Bombay Presidency.

**Measures to prevent the spread of infection.**

Chapters X to XII describe the measures that were adopted to prevent the spread of plague by land, by sea, and by articles likely to carry the germs of the disease.

**Staff.**

In Chapter XIII some details are given regarding the medical and military staff employed on duty connected with the plague, and of the remuneration that was granted to them.

**Regulations enforced in foreign countries.**

Chapter XIV contains an account of the regulations enforced in foreign countries against persons and merchandise arriving from India.

**The pilgrimage to Mecca.**

Chapter XV deals with the pilgrimage to Mecca from the point of view of the danger apprehended of the introduction of plague into the Hedjaz and thence into Europe.

**Lessons to be derived from the recent experience of plague.**

In the sixteenth and last chapter a brief summary is given of the conclusions with regard to the best means of combating plague which are to be derived from the experience of the present and former epidemics.

**Appendices to the report.**

Attached to the report are a set of appendices consisting mainly of copies of the orders issued by the Government of India and the Local Governments and Administrations, of a selection of papers from the official correspondence on the subject of the plague, and of reports submitted by officers in charge of the operations at important plague centres. The appendices are arranged under heads corresponding to the chapters.

# CHAPTER II.

## DESCRIPTION OF PLAGUE: ITS CAUSES AND CHARACTERISTICS.

### Cause and Nature of Plague.*

Plague due to a specific bacillus. Discovery by Kitasato and Yersin.

It has been demonstrated that plague is due to a specific bacillus. "The existence of the plague bacillus," says Metchnikoff, "had long been foreshadowed, but no proof of its existence could be given until the labours of Pasteur and subsequently of Koch, and of their schools had paved the way." The discovery of the bacillus was made almost simultaneously and independently by Kitasato and Yersin during the Hong-kong epidemic of 1894. During the present epidemic the previous conclusions have been verified and the investigation into the bacteriology of the disease has been carried further by M. Haffkine, Mr. Hankin, various medical officers of the Government of India, the members of the scientific missions sent to Bombay by Egypt, Germany, Austria, and Russia, and other foreign scientists.

Description of the bacillus, and occurrence in the human system.

The so-called cocco-bacillus of plague is a short thick rod with rounded ends. It is found in large numbers in the buboes, and may be present in the blood, expectoration, urine and excreta of the sick.

Cultivation.

The bacillus can be cultivated in artificial nutritive media. The growth in bouillon containing an excess of fat is specially characteristic.

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* Hirsch, Handbook of Geographical and Historical Pathology (New Sydenham Society's translation). B. Scheube, Die Krankheiten der Warmen Länder; Fischer, Jena, 1896. Yersin, La Peste Bubonique à Hong-kong; Annales de l'Institut Pasteur, 1894. Yersin, Calmette et Borrel, La Peste Bubonique; Annales de l'Institut Pasteur, 1895. Wilm, A Report on the Epidemic of Bubonic Plague at Hong-kong in the year 1896. Colonial Reports, Miscellaneous, No. 6, Hong-kong, Bubonic Plague, 1896. James, Report on the 1894 epidemic of Bubonic Plague at Hong-kong; *Indian Lancet*, September 16th, 1897.

Gatacre, Report on the Bubonic Plague in Bombay. Report on the Plague in Poona (Appendix VI). Report on the Plague in Sind (Appendix VI). Report of the Commission sent by the Egyptian Government to Bombay to study Plague. Article regarding the conclusions of the German Plague Commission in the *Deutscher Reichs-Anzeiger und Königlich Preussischer Staats-Anzeiger* of the 20th July, 1897. Wyssokowitz and Zabolotny, Members of the Russian Plague Commission, Recherches sur la Peste Bubonique; Annales de l'Institut Pasteur, 1897. Metchnikoff, Sur la Peste Bubonique; Annales de L'Institut Pasteur, 1897.

**Action of the plague microbe on the human organism.**

Dr. H. Bitter (of the Egyptian Plague Commission) has given the following clear and important statement of the manner in which the microbe acts on the human organism and the forms of disease which it engenders:—

"La peste, comme on le sait, est une maladie des plus multiformes connues; tous les anciens auteurs qui ont observé des épidémies, insistent sur ce point.

**Multiform nature of plague.**

"Aussi fus-je surpis moi-même au commencement de mes observations de voir combien les symtômes cliniques de la maladie sont différents, et combien peuvent varier les altérations pathologiques que l'on trouve lors de l'autopsie.

"Si l'on prend en considération combien dans d'autres maladies épidémiques, telles que la fièvre typhoïde, la fièvre à rechutes, la petite vérole, la pneumonie, les cas se ressemblent, présentant presque invariablement le même tableau clinique, et que dans d'autres, comme le choléra, la diphthérie, les symptômes ne varient que dans des limites assez étroites, on pourrait de prime abord, conclure que les différentes formes de peste sont autant de maladies différentes.

"Comme je l'ai dit plus haut, je n'entrerai pas dans les *détails* cliniques et pathologiques, je donnerai seulement ce qui est nécessaire pour faire comprendre mes explications sur la nature de la maladie.

**Three distinct forms of plague.**

"Pour le moment, il suffira de dire que tout le pêle-mêle de symptômes qui semblait presque inextricable au commencement, peut être réduit à trois formes assez distinctes de la maladie, lesquelles ne sont pas construites artificiellement mais qui se basent logiquement sur la différente localisation dans l'organisme du bacille pathogène, qui d'après son siège cause des symptômes et des lésions pathologiques différents.

"Avant d'entrer dans une description détaillée de ces trois formes, il me semble nécessaire pour me faire bien comprendre, d'expliquer brièvement l'idée générale que l'ensemble de mes examens m'a donné sur la *nature de la peste et du bacille que la produit.*

"En posant déjà ici le résultat définitif de mes études, je crois rendre plus clair ce que j'ai à dire sur la pathologie et les symptômes de la peste qui m'ont amené à mes conclusions.

"Le bacille de la peste appartient à la classe des microbes *septicémiques.* Ces bactéries se caractérisent de la manière suivante:

**General characteristics of septicæmic bacilli.**

"Quand on inocule à un animal *susceptible* une quantité minime d'une culture du microbe, ce dernier commence immédiatement à se multiplier, et, sans produire une réaction locale apparente, il entre dans le sang de l'animal où il trouve le champ réel de son développement et ou il pullule librement jusqu'à ce que tout le système vasculaire soit rempli de bacilles et que l'animal succombe.

"Cet effet se produit invariablement si l'animal inoculé est *susceptible au plus haut degré.*

"Pour chaque sorte de septicémie, il y a une ou plusieurs espèces d'animaux qui possèdent cette susceptibilité absolue. Il y en a d'autres qui ne sont point susceptibles; on peut leur inoculer des quantités énormes d'un bacille septicémique, et n'obtenir aucun effet. Mais parmi les espèces prédisposées et les espèces réfractaires, il existe ordinairement des races d'animaux qui accusent toutes les gradations de sensibilité. Généralement une susceptibilité diminuée s'observe de la manière suivante: Tandis que l'animal prédisposé ne montre aucune réaction après l'inoculation, l'animal moins susceptible réagit au contraire par une inflammation locale plus ou moins forte. Nous devons voir dans cette réaction une action de l'organisme contre le microbe. Quelque fois le bacille réussit quand même à entrer dans le sang et l'animal succombe. Mais dans d'autres cas, l'organisme arrive à maîtriser le micro-organisme sur le point d'inoculation; il y est tué dans le tissu inflammé qui souvent après finit par être detruit par suppuration.

"En réalité, les phénomènes que je viens d'esquisser, sont beaucoup plus compliqués. Comme il y a une sensibilité différente par races, il s'y ajoute souvent, chez les animaux d'une susceptibilité incomplète, l'influence d'une prédisposition individuelle. En outre, la virulence du bacille inoculé et la quantité de microbes introduits dans l'organisme, peuvent exercer une influence considérable sur le résultat de l'inoculation. Il serait trop long d'exposer ici d'une façon detaillée toutes ces éventualités, bien-que chacune d'elles puisse exercer son influence dans la peste.

Instance of anthrax.

"L'exemple le meilleur et le mieux connu d'une septicémie du genre décrit, est le charbon. La quantité la plus faible du bacille spécifique introduite dans une petite plaie, aux souris ou aux cobayes, les tue avec une sûreté absolue sans que la moindre réaction locale soit visible. Chez les lapins, il se montre déjà souvent une réaction locale, très faible il est vrai; cependant il y a parfois des animaux qui survivent. Chez les bœufs et les chevaux, la réaction locale est très prononcée sous la forme d'un œdème énorme qui apparaît autour de l'endroit de l'inoculation. Mais malgré cela, une grande partie des animaux meurt encore de septicémie.

"Chez *l'homme*, la susceptibilité pour le charbon est encore moindre. La réaction locale se produit très nettement et d'une manière très prononcée sous la forme de la *pustule maligne* ou de *l'anthrax*. Dans la plupart des cas, l'individu échappe, mais d'autre part il y a un assez grand nombre d'anthrax suivis de septicémie mortelle. Si, les bacilles charbonneux entrent (avec la nourriture, etc.) dans l'intestin

de l'homme, la conséquence est une inflammation aiguë de cet organe (entérite) qui est suivie presque toujours d'une septicémie mortelle. De même les spores entrés dans le poumon y causent d'abord une pneumonie qui donne lieu ensuite à la septicémie.

**Similarity between plague and anthrax.**

" Or, dans la peste, nous trouvons vis-à-vis d'une maladie qui ressemble sous beaucoup de points au charbon.

" La plus faible quantité du bacille spécifique virulent inoculé aux souris et aux rats, les tue invariablement par septicémie, sans qu'une réaction locale apparente se produise.

**Degree of susceptibility of man to plague.**

" L'homme, de son côté, ne prossède pas *cette susceptibilité maxima pour le bacille de la peste ; il y est jusqu'à un certain point réfractaire.* Par conséquent, chez lui, l'entrée dans le corps du bacille se marque toujours par une réaction locale plus ou moins intense, et ce n'est que dans un certain nombre de cas que la localisation primaire des bacilles est suivie de septicémie.

**Local reaction in the lymphatic glands.**

" Mais il y a une particularité dans la peste qui la distingue d'autres septicémies connues ; c'est qu'en général, la réaction locale causée par l'invasion du bacille de la peste, *ne se produit pas à l'endroit de l'inoculation même, mais dans les glandes lymphatiques de la région correspondante.*

**Buboes.**

" Cette réaction s'accuse surtout par un gonflement douloureux plus ou moins prononcé des glandes. Ce sont précisément ces glandes gonflées, que l'on appelle *bubons*, et qui depuis longtemps, sont considérées comme le symptôme le plus caractéristique de la peste et qui lui ont valu le surnom de *peste bubonique.*

**Cases in which the bacillus does not penetrate beyond the affected glands.**

" Au commencement de la maladie, les bacilles sont confinés exclusivement dans ces glandes ; ils s'y multiplient et créent par cela, outre les altérations locales, des symptômes généraux plus ou moins graves. Dans un certain nombre de cas, les microbes restent dans les glandes pendant toute la durée de la maladie ; ils n'entrent ni dans le tissu qui se trouve autour des glandes ni dans le système vasculaire. L'organisme qui lutte contre eux, réussit à les empêcher de pulluler davantage et à les tuer enfin sur le champ de leur premier développement. Les tumeurs glandulaires finissent alors, dans un petit nombre de cas, par être résorbées, ou, dans la majorité des cas, leur pulpe est transformée en pus ; les cas de ce genre sont ordinairement suivis de guérison.

**Cases in which the bacillus enters the general system.**

" Dans une autre catégorie de cas, l'organisme succombe dans la lutte contre le bacille. Il n'est pas en état de le confiner dans les glandes. Le microbe vainqueur rompt pour ainsi dire le filtre que l'organisme lui oppose et pénètre dans le tissu avoisinant et finalement dans le sang où il se développe librement. Nous avons alors la septicémie qui est toujours fatale.

"Il existe une troisième classe de cas, qui a une analogie avec le charbon pulmonaire. Tandis que dans les deux catégories précédentes, la porte d'entrée du microbe est formée par une *petite plaie* elle est représentée dans la dernière par le *système respiratoire.* Le bacille entre par inhalation directement dans les *poumons* et s'y localise sur un ou plusieurs endroits, et commence à se multiplier. La conséquence est une forte réaction locale qui se montre sous la forme d'une pneumonie *lobulaire* plus ou moins étendue. *Dans ces cas on ne trouve pas de bubons.* Pneumonic form of plague.

"Il semble que dans des cas pareils l'organisme n'arrive guère à maîtriser le bacille; Les cas observés à Bombay furent, sauf un, tous mortels.

"Pour le répéter encore une fois, nous pouvons donc distinguer trois différentes formes de la peste. The three forms of plague.

"1°. La forme *bubonique simple* où l'infection reste restreinte à une seule ou à un groupe de glandes lymphatiques. Ces cas sont ordinairement suivis de guérison.

2°. La forme *septicémique* qui est toujours mortelle.

3°. La forme *pneumonique.*

"Il n'est pas impossible qu'il existe encore d'autres formes de peste, par example une forme *intestinale* dont font mention les auteurs qui ont observé la peste à Hong-kong. Mais à Bombay, ni dans les observations cliniques ni dans les autopsies, je n'ai pu trouver aucun indice prouvant une infection de ce genre. Other possible forms.

"La multitude des symptômes cliniques et des lésions pathologiques que j'ai mentionnés plus haut, s'explique du reste entièrement par les trois formes de la peste que je viens d'indiquer, et, en outre, par le fait qu'il arrive assez fréquemment dans la première et seconde forme *d'infections secondaires* par d'autres micro-organismes, surtout par les microcoques pyogènes qui de leur côté influent sur l'apparence clinique."

The following classification of the different forms of the disease, based on symptoms, and derived from a review of the opinions of the different medical officers who studied the plague in Bombay, is given in General Gatacre's report on the Bombay Plague: — Classification of different forms of plague contained in General Gatacre's report.

"1. With enlarged glands (gravity according to symptoms and severity of attack). Femoral. Inguinal. Axillary. Cervical. Tonsilar.

| | | |
|---|---|---|
| | | Septicæmic. |
| | | Pneumonic. |
| "2. Without enlarged glands (almost always fatal). | | Mesenteric, enteric or gastro-intestinal. |
| | | Nephritic. |
| | | Cerebral. |

"The characters of the forms and types are due to a variation in the method of entry into the body of the poison which is the direct source of the disease and common to all. The forms and types may be mixed so as to produce a combination of the characters of two or more, and each may be varied by a degree of intensity, mild, severe, or hæmorrhagic. The hæmorrhagic condition is more often associated with those types of the disease in which the glands are not enlarged, and is always most grave as it shows great destruction of the blood constituents. The hæmorrhages may be petechiæ, or extravasations or exudations from the mucous tracts.

"It must be carefully observed that the diagnosis of a type is not made upon the complications which are likely to occur in all. Many cases of the form with buboes show complications affecting the lungs or the brain, but the type is a definite one, and the complications are distinct from the evidences of a type.

**Relative proportion in which the types occurred in Bombay.**

"The relative proportion in which different types occur is fairly represented by the following records:—

*Port Trust Hospital.*

| | About |
|---|---|
| Enlargement of cervical glands ... ... | 5½ per cent. |
| „ of axillary glands ... ... | 14 |
| „ of femoral and inguinal glands ... | 48 |
| Mixed variety ... ... ... ... | 2½ |
| Abortive „ ... ... ... ... | 28 |

*In No. 10 District.*

| | |
|---|---|
| With enlargement of glands generally ... | 85 per cent. |
| „ „ of femoral and inguinal glands | 60 „ |
| „ „ of axillary ... ... | 17 „ |
| „ „ of cervical ... ... | 9 „ |
| Pneumonic type ... ... ... | 12 „ |
| Gastro-enteric type ... ... ... | 3 „ |

It would seem that Dr. Bitter is not right in saying that the intestinal form of plague did not exist in the Bombay epidemic. It is stated in General Gatacre's report that, though rare, this type did exist as a primary form of the disease.

## Symptoms.

Hirsch's description of the symptoms.

Hirsch gives the following description of the symptoms of plague :—

"Plague is an acute infective disease, characterised essentially by an affection of the lymphatic system, namely, inflammatory swellings of the external and internal lymphatic glands (buboes); to these are joined not unfrequently other local lesions, and a series of symptoms proceeding from general infection, which, however, are neither constant nor properly pathognomonic of the morbid process. In plague, as in all acute infective diseases, various gradations of form may be distinguished, according to the severity of the sickness: first, an explosive type in which the patient dies of general poisoning within two or three days, without developing buboes to any considerable extent; next, severe or moderately severe cases with full development of the local process; and finally, a mild form in which there are buboes without any general symptoms, and the prognosis uniformly good. All these various degrees of development in the disease have been found side by side in all epidemics of plague; and the unity of the morbid process is further evinced in the fact that all the affections, local or general, that complicate the process are met with more or less frequently in every epidemic."

Yersin's description.

This description which is based on the experience of former epidemics corresponds closely to the description of the disease given by those who have observed it in the recent epidemics in Hong-kong and the Bombay Presidency. The following is Yersin's description of the course of the malady and its symptoms as observed in the Hong-kong epidemic of 1894:—

"There is a period of incubation of from four to six days after which the onset is sudden and accompanied by depression and prostration. The patient is immediately attacked by strong fever, often accompanied by delirium. After the first day a bubo, usually a single one, appears. In 75 per cent. of the cases it is situated in the groin, and in 10 per cent. in the armpit; more rarely it appears in the neck or in some other part.

"The gland soon swells to the size of a hen's egg. Death occurs at the end of 48 hours, or often earlier. When the patient lives for more than five or six days, the prognosis is better, the bubo suppurates and can be operated on.

"In some cases there is not time for the bubo to develop; in such cases the only morbid appearances are mucous hæmorrhage or petechial spots on the skin."

Description given in

An enormous number of clinical observations have been made and recorded during the present epidemic and have added largely to the

General Gatacre's Report.

medical knowledge of the disease. The following very complete account is extracted from General Gatacre's report and is based on the observations of the many experts who studied the disease in Bombay:—

General symptoms.

"The possibility of such a classification of plague as the foregoing (*reproduced in the preceding section of this chapter*) shows that each type has characteristic signs and symptoms due to the typical development of the case, but at the same time there are certain general symptoms common to all cases which are due to the virus, the fountain-head of all the manifestations of the disease. These are now well known, and with them are associated the different features of some one or more types, so that the general symptoms are the basis of the diagnosis of the disease, while the local or visceral conditions constitute the revelation of the type.

"The onset is, as a rule, very sudden, and commences with a more or less severe rigor, followed by a rapid rise of temperature, or there may be only a sudden rise of temperature. The countenance has an expression of fear; there are nausea and often vomiting which may be severe and constant, intense headache, injection of the ocular conjunction, and a feeling of great prostration, aggravated by the vomiting and, further, by inability to sleep which is a marked symptom. The character of the tongue is a definite one, and the patient is irritable in showing it and does so in a jerky way, or moves it rapidly from side to side when protruding it. It is moist and thickened, the edges and tip are clean and coloured from light to deepish red, and it is coated on the rest of its surface with a thin fur, often of a peculiar white glistening appearance, or of a light reddish brown colour. There is also a perceptible impediment in the speech.

"The pulse varies in rate from 100 to 140, and also in volume; usually it is full, soft and dicrotic, the latter sign being recognisable even in the early stages of the disease, and it becomes thready as the heart's action gets dangerously weak. The bowels are generally constipated, often to an obstinate degree, but in some cases they are relaxed, and the motions then have a peculiarly offensive smell.

"There may be also a short dry cough, and a darting pain in some lymphatic gland regions. The urine is highly acid and rapidly decomposes on standing, triple phosphates being deposited, and the specific gravity varies from 1010 to 1035. The urea and uric acid are diminished, and albumen is present in a number of cases.

"With the progress of the case the temperature rises quickly, usually reaching a maximum of 103, 104, or higher, about the third or

fourth day, though in severe cases earlier; the pulse becomes weaker, and in the worst cases the temperature rises very high and the patient succumbs to the peculiarly exhausting effects of the disease in a very short time: 24 or 48 hours, or even less. If the patient survives the acute early stage, the febrile symptoms are more aggravated with the rise of temperature, the pulse becomes thready, the tongue is less moist and more irritable at the tip and edges, while the prostration and insomnia increase and cause a look of deep anxiety and distress.

"In those cases where cerebral symptoms supervene, certain features manifest themselves about the third day, which are due either to congestion of the nervous centres or to involvement of them in the septicæmic process. The look of anxiety now gives way to heavy expressionless countenance, which is liable to be mistaken for an improvement, but is really due to want of control over the muscles and loss of tone in them. The patient is sensible of all that goes on near him, but appears to be only partially conscious, listless and drowsy, and it is with difficulty he can be made to hear distinctly. His speech is thick and indistinct from loss of power of co-cordination of muscular movements, which is noticed also in most of his other muscular efforts; these effects are due not only to an implication of the cerebral and spinal centres in the toxæmic results, but also to some general peripheral neuritis, the results of which continue as sequelæ in some of the cases. There may be also cramps in the muscles. In other cases there is a great irritability of the cerebral centres, which is shown by violent delirium. The further progress of the case depends upon its circumstances according to type, and in those cases where the symptoms peculiar to the type improve and the temperature goes down, the cerebral symptoms remain for some time and then gradually subside. When the primary symptoms increase or the type is complicated, the symptoms attributable to the nervous system may assume the form of violent delirium or coma vigil, the latter being most grave.

"The general symptoms above detailed characterise all the types of plague, and the adjunctive features peculiar to each type may receive brief mention.

"The *glandular or bubonic* is the common form of plague, and comprises about 80 to 90 per cent. of all cases. Coincident with all or some of the general symptoms, one or more swellings appear at some of the positions in which lymphatic glands exist, the usual ones affected being those of the femoral region, and those less commonly affected being the glands of the anterior axillary and cervical regions. The swelling sometimes appear at the onset, usually on the second or third day, and often not until later, in the course of the **Bubonic type.**

attack. They consist of single glands, chains of glands, or two or more separate glands agglomerated into a mass. The skin over them is warm, tense if the bubo be large, and very tender. Sometimes they subside and gradually disappear. Very often they suppurate and burst, and a sudden rise of the temperature in the course of an attack generally indicates the appearance of a fresh bubo.

**Tonsilar type.** "The *tonsilar type* is a very peculiar one, and is characterised by great swelling of the tonsils and the glands of the neck on one or both sides. There is also nasal catarrh, and the appearance of the patient is strange, with the large swollen neck, open mouth, and inflamed sore nose, from which secretion runs. The great dangers of these cases are asphyxia from œdema, and cellulitis extending down into the chest.

**Septicæmic type.** "The *septicæmic type* is characterised by an intensity of the general symptoms due to direct entry of the virus into the blood. Enlarged glands may appear in several regions later on.

**Pneumonic type.** "The *pneumonic or thoracic type* is that variety in which the lungs are primarily infected, most probably by inhalation of the virus, and one or both of the lungs are attacked most commonly with lobular pneumonia, although conditions indicative of lobar pneumonia are also sometimes found. An abstract of the report of the Russian Plague Commission read by Professor Wyssokowitz before the Bombay Medical and Physical Society shows that after a certain period the patches of the lobular pneumonia coalesce so as to form circumscribed areas of exudation in healthy tissue, and that the whole lobe is never consolidated in plague pneumonia, as it is in lobar pneumonia. This type is very fatal, and in severe cases is occasionally complicated with the development of external buboes, which arise from a secondary extension of the virus.

**Gastro-enteric type.** "The *gastro-enteric or abdominal type* as a primary form of plague is rare, and the earlier symptoms are difficult to distinguish from those of the tropical enteric fever which they greatly resemble. The diagnosis would mostly depend upon the general symptoms and the peculiar form of the abdominal symptoms which are its leading features. The eruption, if there is any, is more petechial in character; the abdominal distension appears early and has not the signs of that which occurs in typhoid; also there are severe lumbar pains, retching and vomiting, and inability to gain rest except in certain postures. If diarrhœa occurs, the characters of the stool do not resemble those of typhoid; the bowels may be inactive, but this is by no means a criterion, as many cases of tropical typhoid fever are accompanied with constipation in the early phases. The diagnosis must rest on the recognition of the general symptoms, the early

appearance of abdominal distension, the characters of the stools and bacteriological tests, and examinations of the blood. A variety of this type has been seen which is choleraic in character, the predominant symptoms being an imperceptible or only slightly perceptible pulse, cold extremities, and excessive vomiting and diarrhœa. The presence of a high temperature as indicated by the thermometer would indicate the nature of the disease.

Hydrophobic type.

"A symptomatic effect which has been seen in the glandular form of plague is one of *hydrophobic symptoms*. It has been described as a *hydrophobic type*, the prominent symptoms being a terrified expression, difficulty in swallowing fluids, inability to spit or expectorate and extreme restlessness. The fever and the bubo reveal the true nature of the illness, and the hydrophobic symptoms may be a hysterical display of the terror with which the disease is associated."

Pulmonary type in India and in the Black Death.

In the account of the plague given by Hirsch stress is laid on the fact that the pneumonic type is a characteristic form of plague in India. He points out that although the complication of plague with bleeding from the lungs has occurred in many other epidemics, it is only in the case of the Black Death and Indian plagues that the cases are frequent enough to amount to a clearly marked feature of the epidemic. The pulmonary disorder was frequently observed both in the 1812—1821 outbreak in Gujarat and in the 1836 outbreak in Rajputana. The account given above shows that the pulmonary form of the disorder has been equally marked in the present epidemic.

## Mortality.

High mortality.

The extremely fatal nature of plague is notorious and has characterised all epidemics of the disease. A comparison of the total number of reported seizures and deaths in the Bombay Presidency and Sind from the beginning of the outbreak up to the 27th August gives 80 per cent. of fatal cases. It is difficult to say how nearly this figure approximates to the actual circumstances. On the one hand, it is probable that cases which were not really plague were included in the reports, and, on the other hand, the less severe cases readily escape detection. The mortality shown by the hospital returns is less than the above figure. The following was the percentage of fatal cases during the first period of the epidemic in the hospitals at Bombay, Karachi, and Poona:—

General statistics.

Mortality in hospitals.

| | |
|---|---|
| Bombay ... ... ... ... ... | 53·1 |
| Karachi ... ... ... ... ... | 59·1 |
| Poona ... ... ... ... ... | 64·1* |

* This figure is only approximate.

A circumstance tending to increase the mortality in plague hospitals is that the severe cases are the more likely to be brought there. Many patients were admitted in a moribund condition.

Mortality in Hong-kong.

The following extract from a report by Sir William Robinson, the Governor of Hong-kong, on the Hong-kong epidemic of 1896 shows that the rate of mortality during the Hong-kong plague was higher than the rate has been in India :—

"The mortality generally, as compared with 1894, shows a slight improvement. The total number of Chinese cases up to noon on the 4th instant was 675, and the number of deaths 602, or a little more than 89 per cent., whereas in 1894 the mortality among the Chinese who were treated in hospitals was 93 per cent.; and it must also be borne in mind that in the latter calculation no account is taken of dead bodies found in the streets and sent at once to the burial-ground, while the returns for the current year include *all* deaths from the plague."

Mortality in different types of plague.

In the account given by Dr. Bitter, reproduced in the first section of this chapter, it is said that the simple bubonic cases usually end in recovery, and that the septicæmic cases are invariably fatal. The reports of the Bombay hospitals show that this last statement is somewhat too emphatic, though no doubt recovery in both septicæmic and pneumonic cases is comparatively rare. Surgeon-Captain Thomson gives the following account of the results observed at the Parel Hospital, Bombay :—

"Cases without palpable buboes were most fatal, averaging 78·6 per cent. Many of such cases died early of convulsions, coma, and syncope, overwhelmed by toxic products suddenly attacking the great nerve centres, as it were, before there was time for an inflamed gland to arise.

"The next most fatal were left axilliary and right cervical in the same proportions, then right axilliary and right parotid in nearly the same ratio; next came inguinal, and next femoral; and multiple seemed to be least fatal.

| | |
|---|---|
| Buboes on the right side had | 66·7 per cent. mortality. |
| „ „ „ left „ „ | 58·3 „ „ „ |
| „ in the upper part of the body | 69·3 „ „ „ |
| „ „ „ lower „ „ „ „ | 57·2 „ „ „ |

"The nearer the head the more fatal the case, and those with buboes in the neck, and especially in its anterior aspect were very fatal."

Influence of race, sex and age.

Comparing the experience of the different hospitals, race does not seem to have any marked effect on the rate of mortality. The

female sex has shown a general excess of mortality. Age does not seem to influence the course of the disease.

## Signs after Death.

The following description is from General Gatacre's report :—

Description in General Gatacre's Report of the signs after death.

"If the position of the body has not been altered after death, it will invariably be found lying on either side with the knees flexed and the head leaning towards the chest; rigor mortis is delayed; there is softness and want of cohesion of the fibres of the muscles, the thumbs point towards the palms of the hands; the features have a fixed anxious expression; the eyes are sunk in and muddy in aspect with a peculiar lustre of the cornea, the pupils being dilated and the lids half closed; the tongue is swollen and coated with fur of a glistening appearance and is clean at the tip and edges; the fur is dry, white or yellowish-brown, cleft down the centre, and horny. The complexion is opaque and dingy, the skin is dry, and if death has been recent, the forehead and hands are cold and clammy; and enlargement of the glands in one or other locality would decide the opinion that death had been due to plague.

"If death occur during delirium or convulsions, there may be distortion of the features, in which, if the patient dies while on his back, the head is thrown to either side and the legs are separated. Petechial spots may also be noted, although in the epidemic in Bombay they have been comparatively few. In death from pneumonic plague the body and face have a dusky bluish livid hue, sputum hangs about the lips, and the body seems shrunken and collapsed."

## Bacteriological examination of different forms of Plague.

Dr. Bitter's bacteriogical examination of different types of plague.

The following is a summary of Dr. Bitter's bacteriological examination of different forms of plague. The subject is of particular importance inasmuch as it affords a clue to the manner in which plague is spread from sick persons.

*Simple Bubonic Plague*.—The bacilli die quickly in a suppurating gland. No bacilli were found in the blood of any patient who recovered from plague. Nor were bacilli found in the sputum, urine or fæcal matter of any patient suffering from simple bubonic plague.

*Septicæmic Type*.—An examination of living patients showed the existence of bacilli in the primary bubo and the surrounding tissue.

Shortly before death bacilli were found in numbers in the blood and bacilli were in two cases detected in blood-stained sputum.

An examination of dead bodies disclosed the presence of enormous quantities of bacilli in the glands primarily affected. In the neighbouring glands they were found in smaller number. Bacilli were found in all cases in the blood; in most cases abundant and in some cases rare. In the liver, kidneys and lungs they were found to about the same extent as in the blood; in the spleen they were more abundant. Bacilli were discovered in the urine, in the large intestine and in the sputum.

*Pneumonic Type.*—Enormous quantities of bacilli were found in the pneumonic foci and in the congested parts surrounding them. In the healthy tissue of the lung they were not frequent. Large numbers were found in the fluid in the bronchi. In the bronchial glands there were no bacilli at all, or only a few. In the blood and in the spleen and other abdominal organs few bacilli were detected. In the lymphatic glands there were either none or they were not more numerous than in the blood.

## Difficulties of Diagnosis.

**Scheube's remarks on diagnosis.**

Scheube makes the following remarks:—

"The diagnosis of the plague is frequently difficult particularly at the commencement of epidemics. In severe cases, *malignant* malaria and typhus may be mistaken for it; and in milder ones venereal buboes and other lymphatic inflammations may lead to errors in diagnosis What is decisive for the diagnosis is epidemic occurrence, *i.e.*, coincidence with the presence of an epidemic,the extraordinarily severe general suffering accompanied by high fever, and the buboes. Even although there may be exceptionally rapid cases in which the buboes are absent, these will in any epidemic be cases of a typical nature, leaving no possible doubt of the nature of the diagnosis."

**Difficulty of diagnosing isolated cases or cases during the beginning of an epidemic. Failure to detect the first cases in Bombay.**

It is, however, at the beginning of an epidemic or on the occurrence of isolated cases that the diagnosis is of special importance and that the failure to detect the disease may lead to the most serious consequences. In the autumn of 1896 the existence of bubonic plague in Bombay for some time escaped detection.

There is reason to believe that cases of plague occurred for some months before the existence of the disease was discoverd, and that from the latter part of August onwards these cases were sufficiently numerous to affect materially the general mortality of the City. The grounds on which this opinion was formed are explained in Chapter V.

In the report prepared by Mr. Snow, the Municipal Commissioner of the City of Bombay, the following remarks are made with regard to the difficulty experienced in diagnosing plague: Difficulties in diagnosing the disease experienced in Bombay.

"The difficulty of accurately diagnosing this multiform disease is admittedly very great; many suspicious cases were put down as diphtheria; the resemblance to enteric often made the differential diagnosis exceedingly difficult in the absence of bacteriological examination; and even bacteriological examination not infrequently proved abortive in clear cases of the plague. The disease in its more infectious type was generally pneumonic and devoid of glandular enlargements, or was wont to take the form of high fever with slight cough. Doctors often differed in their opinions about cases, and no clearer illustration of the difficulties of diagnosis can be given than the fact that at the latest stages of the epidemic numbers of cases had to be segregated—and that by medical officers—not because the patients had plague, but because they had suspicious symptoms."

Dr. McCabe Dallas, who was in charge of the Grant Road Plague Hospital in Bombay, stated that during the early months of the epidemic the pulmonary form of the disease escaped detection and thus spread the infection unchecked. Dr. Bitter also noticed the difficulty of diagnosing pneumonic cases by clinical symptoms.

The experience of the City of Bombay illustrates how plague may escape detection at the beginning of an epidemic. On the other hand, when the alarm of plague has been raised, cases are often diagnosed as plague which are really unconnected with that disease. On a number of occasions reports were made to the Government of India of the occurrence of plague cases in different parts of India which subsequently were found not to be true cases of plague. Cases diagnosed as plague which are really unconnected with that disease.

The most important instance occurred in the city of Calcutta. Early in October 1896, that is to say, shortly after the existence of plague in Bombay had been ascertained, the occurrence of ten cases in Calcutta and one in Howrah affirmed to be plague was reported by medical officers to the Special Medical Board appointed by the Government of Bengal. Considerable alarm was experienced, but after sifting the evidence the Medical Board were able to report* that these eleven cases were not true cases of plague, but simple cases of enlarged glands, fever, bronchitis, and venereal disease. They stated that looking only to the clinical symptoms they had no hesitation in expressing their emphatic opinion that none of the cases could properly be described as cases of bubonic plague. Instance from Calcutta.

* Appendix I.

**Simple instructions circulated by Local Governments.**

Some of the Local Governments and Administrations published a simple statement of the symptoms of the disease with a view to assist their officers and other persons in determining whether grounds existed for suspecting a case of plague and for adopting the prescribed precautions. The following extract from the orders circulated by the Government of the North-Western Provinces and Oudh will suffice as an example :—

"The symptoms of plague are fever of recent commencement, violent headache, severe pain in the back and limbs, and lassitude. The glands in the groin, or in the armpit or neck, are generally swollen and tender, but this is not invariably the case. Cough and pain in the lungs are frequently observed, and delirium often comes on early in the disease. Death occurs often in two or three days."

In Bombay the Plague Committee issued simple instructions to the Justices of the Peace and the non-medical officers who were on the Committee's staff.

**Bacteriological tests. Microscopical examination and cultivation.**

Bacteriological research affords tests of importance in diagnosing plague. A microscopical preparation made with the contents of the affected gland shows numerous diplobacteria of characteristic shape and size. A microscopical preparation made with the blood of the patient is also sometimes employed, but the bacteria occur in lesser number, or, in cases of simple bubonic plague, not all, and the test is more difficult and less reliable. In pneumonic cases the vast number of bacilli in the sputum facilitate bacteriological examination. Experience has shown that although the microscopic test is of great utility, it cannot altogether be relied on, and certainly not unless performed by a person with special knowledge and training. The cultivation of the bacteria by placing the infected matter in nutritive media gives a characteristic and more certain result. Dr. Bitter states that it is impossible to obtain conclusive results by merely preparing a coloured microscopical preparation from the blood ; to obtain reliable evidence it is essential that a cultivation should be made. But even in this case the experiment to be entirely trustworthy must be made by a bacteriologist of experience. In Appendix No. I is an instructive note by Brigade-Surgeon-Lieutenant-Colonel D. D. Cunningham on the misleading character of the results obtained by the bacteriological investigation in connection with the alleged Calcutta plague cases alluded to above. The medical officers who first investigated the cases alleged that they had found bacilli of plague in the blood of six of the patients. Dr. Cunningham demonstrated that all these so-called plague bacilli might be readily obtained from specimens of the blood of perfectly healthy animals under the influence of brief exposure to air, in even scrupulously clean localities.

**Failure of the bacteriological investigation in the Calcutta cases.**

A set of instructions for the symptomatic and bacteriological diagnosis of plague prepared by M. Haffkine is contained in Appendix I. **M. Haffki instructior diagnosis.**

## Period of Incubation.

The time over which the period of incubation may extend is a most important matter from the point of view of preventive measures. Yersin gives the period at four to six days. Scheube states that the period ranges from two to seven days, that in particularly virulent epidemics it may only take a few hours, and that quite exceptionally it may last as long as fifteen days. Wilm states that the observations made in the Hong-kong epidemics of 1894 and 1896 showed that the period of incubation might extend to nine days, but was usually three to six days only. He cites one case in the jail in which the period apparently extended to fifteen days. In the Venice Sanitary Convention of March 1897 a ten-days period is taken as the practical basis for preventive measures. The same period has been adopted for the precautionary measures taken in India. **Previous experience.**

It is believed that there has not been a single authenticated case in the present epidemic of a period of incubation of more than ten days. The ordinary period is undoubtedly less than this and as a rule the period does not exceed five days, though in some cases it appears to extend to between five and ten days. Special opportunity was given for investigating the period of incubation in the camps that were established in many places for the shelter of persons made to evacuate infected localities, and for the segregation of persons who had been specially exposed to the risk of infection. **Experience of the present epidemic. Ten days the maximum period.**

In the large segregation camps which were established at Poona the cases of plague which occurred were discovered after the following intervals:—

| | | | | | |
|---|---|---|---|---|---|
| On the 1st day of segregation | | | ... | ... | 3 cases. |
| „ | 2nd | „ | „ | ... | ... | 3 „ |
| „ | 3rd | „ | „ | ... | ... | 3 „ |
| „ | 4th | „ | „ | ... | ... | 2 „ |
| „ | 5th | „ | „ | ... | ... | 2 „ |
| „ | 6th | „ | „ | ... | ... | 1 case. |
| „ | 7th | „ | „ | ... | ... | 1 „ |
| „ | 10th | „ | „ | ... | ... | 2 cases. |

It must be remembered in considering these figures that even in segregation camps there is a possibility of fresh infection.

## Predisposing and protective circumstances in the Individual.

The following information is derived from the reports of the Parel and Grant Road Plague Hospitals in Bombay.

Occupation, race, age and sex.

No occupations in themselves predispose to plague. There is also no race predisposition, but the classes who attend to personal cleanliness and live in healthy surroundings secured a marked immunity:—

"The ages most exposed to risk range between 20 and 40 years in both sexes. Thirty years seems the maximum danger point. From youth up to this figure the disease gradually increases, and having reached its height then, manifests a corresponding decline as the age advances. Plague then may be characterised as more virulent in adult life than at any other period.

"Approximately in relation to the sexes, males have been attacked in rather more than twice the number of females, this being probably due to their greater exposure and partly to the fact that a large number of women and children left the city during the course of the epidemic."

Second attacks.

Second attacks of plague are certainly rare, but one attack does not seem to confer complete immunity. The following examples are given in the report of the Parel Hospital:—

"One attack does not confer immunity from another, as one patient had a second and fatal attack, and one had a relapse. The second attack was in a woman aged 40; convalescent 18 days; attacked 27 days after the initial symptoms of the primary attack; and died five days afterwards. The primary attack lasted nine days and the fatal one five days, and in the latter she developed a fresh bubo in a different site from the original one, had fever, delirium, stupor, coma, and unconsciousness. The general characters of an acute attack were present in the tongue; pulse, respiration, skin, eyes, intestinal canal, typhoid state and mental condition. Her temperature had been normal 18 days when the fatal attack came on."

## Dissemination of the Bacillus from the Sick.

Danger of infection varies in different types.

The bacillus multiplies in the organism of those attacked by the disease, and the first stage in the study of its dissemination is to ascertain the mode in which it emerges from them. This differs considerably in the different forms of the disease. According to Dr. Bitter the

Simple bubonic type.

danger of infection from the simple type of bubonic plague is comparatively trifling. There is no danger from the excretions since

they do not contain the bacillus, nor can there be any danger from the bubo whilst it remains closed. If the bubo opens naturally by suppuration there is still practically no danger of infection, since by the time this occurs the bacilli will probably have died. If the bubo is artificially opened before the bacilli have been killed in the course of suppuration, the infectious germs may emerge. But in practice this operation would usually take place in hospital and under proper precautions. The septicæmic form plays a more important part in the propagation of plague since the bacilli are contained in the excreta of the sick.

Septicæmic type.

The pneumonic form is generally admitted to be the most dangerous from the point of view of infection, and this danger is augmented by the fact that it is the most difficult form to recognise. The cases furnish an immense amount of infectious matter, the patient continually expectorating what is practically a pure culture of plague bacilli. Dr. McCabe Dallas (Grant Road Hospital, Bombay) brings the point to special notice. "I would lay stress," he says, "on the infectious disposition of pneumonic plague and its deceptive character to the inexperienced, since, in the absence of any external glandular swelling, such a case might be mistaken for ordinary pneumonia or broncho-pneumonia, whereas every particle of sputa escaping is really a nursery of bacilli in itself."

Pneumonic type.

Surgeon-Captain Thomson (Parel Hospital, Bombay) states that the disease is certainly most infectious in the acute stage. "Once the temperature becomes normal, the risk of infection is over. No instance of the spread of the disease from convalescents to patients near them under observation or suffering from other diseases was met with." He also quotes a remark by Professor Dieudonné that repeated examinations failed to show the presence of the bacilli in the blood or buboes of convalescents when once the temperature had become normal.

## The Plague Bacillus in Nature.

From a practical point of view this subject is of the utmost importance, since an accurate knowledge regarding the vitality and action of the bacillus under ordinary circumstances is an all-important factor in determining the extent to which, and the manner in which, the disease is infectious, and in consequence the nature of the precautions which should be taken to guard against it.

Importance of the subject.

The state of knowledge, at the time of the outbreak in Bombay, on the subject of the behaviour of the plague bacillus outside living organisms, is clearly summed up in the following passage from the

Summary in the report of the Technical Committee of

**the Venice Sanitary Conference of 1897.**

report of the Technical Committee of the Venice Sanitary Conference of 1897 :—

"La présence du contage dans les grands milieux, notamment dans le sol, constitue un des faits les plus intéressants dont la science épidémiologique est redevable aux observations récentes. Ce fait nous rend compte des influences locales depuis longtemps constatées. Il nous explique pourpuoi 'elle se répand difficilement, tandis que le choléra comme l'a fort bien dit notre collégue M. Thorne Thorne, se propage le long des voies de communication humaine, et surtout le long de voies fluviales, avec une rapidité qui échappe à tout contrôle.'

"Attaché au sol souillé des habitations dépourvues de pavé, de plancher, le microbe semble perdre sa virulence quand il vit en saprophyte. On peut hésiter, dès lors, à considérer comme dangereux ou suspects des ballots de marchandises qui auraient séjourné sur les quais loin des quartiers infectés.

"D'autre part, il n'a pas été démontré jusqu'ici que les eaux ouvertes aient servi à la dissémination du germe de la maladie. La Commission juge néanmoins prudent de recommander une surveillance rigoureuse sur l'eau potable, puisque la longue persistance du bacille y semble prouvée par certaines expériences.

"Enfin, les observations récentes et anciennes montrent que le principe générateur de la peste perd rapidement à l'air son activité morbifique. Elle ne se transmet donc pas à de longues distances par les courants atmosphériques et la contagion ne paraît agir que dans un rayon limité. La faible résistance du germe à la dessication, aux actions germicides en général, démontrée par les expériences de laboratoire, vient confirmer ces données de puis longtemps admises par les épidémiologistes."

**Dr. Bitter's account.**

Dr. Bitter has given the following excellent account of the behaviour of the bacillus under different normal conditions, derived from his observations during the present epidemic :—

**Contamination of the environment of the patient.**

"Les bacilles qui sortent du corps du pestiféré par les voies que je viens d'énumérer, contamineront en premier lieu les vêtements et la literie du malade, ensuite, plus ou moins tout ce qui l'entoure, surtout le sol de la chambre, les cloisons, et enfin les mains et les vêtements des personnes qui assistent le malade.

**Wider contamination.**

"Une partie des bacilles entrera avec les déjections dans les latrines, ou sera versée sur le sol des cours intérieures de maisons ou même sur la voie publique ou dans les cours d'eau. Des puits et des denrées alimentaires pourraient être également contaminés. Avec

les cadavres, une masse énorme de bacilles est enterrée dans le sol des cimetières.

"Il se pose maintenant la question de savoir si tous ces dépôts sont autant de sources d'infection et quelle est éventuellement leur valeur relative pour la propagation du fléau.

**The bacillus is capable of producing infection in the state in which it leaves the patient.**

"Pour résoudre cette question, il faut en premier lieu savoir si les bacilles évacués par le malade ou contenus dans les cadavres frais, sont à même ou non de causer une nouvelle infection sans qu'ils subissent préalablement un changement quelconque, ou sans que des conditions locales plus ou moins mystérieuses ne viennent à leur aide.

"Comme on le sait, l'école *localiste* représentée par Pettenkofer, se prononce à cet égard dans un sens affirmatif pour toutes les maladies épidémiques, tandis que les hygiénistes modernes, que l'on nomme *contagionistes*, son d'avis que le microbe tel qu'il est fourni par le malade et par lui-même seul, peut produire la même maladie sur une autre personne.

"Bien qu'à première vue il soit plus vraisemblable que l'opinion des contagionistes, adoptée à présent partout dans la science pour les maladies épidémiques connues, soit également valable dans le cas de la peste, voyons comment les faits se prononcent à cet égard.

"Or, il est absolument certain que le bacille de la peste, tel qu' il sort du corps humain, peut *immédiatement créer une nouvelle infection.* Les animaux rongeurs sont, comme je l'ai dit, capables de contracter la forme septicémique de la maladie. Si on inocule à des animaux de ce genre des sécrétions d'un pestiféré contenant des bacilles spécifiques, ils succomberont aussi bien et aussi promptement en présentant tous les symptômes caractéristiques, comme si on les avait inoculés d'une culture pure.

"Bien plus, nous connaissons plusieurs exemples d'anatomistes pathologiques qui se sont inoculés involontairement en faisant une autopsie sur un cadavre frais de pestiféré ; ils ont contracté une forme sévère de la peste.

"Le bacille de la peste n'a donc pas besoin de mûrir dans le sol ou quelque part pour qu'il devienne infectieux.

**Extent to which the bacillus can multiply outside a living organism.**

"La seconde question à laquelle nous devons répondre, c'est si le germe spécifique peut *se multiplier* en dehors de l'organisme, par exemple dans le sol, dans l'eau, sur des denrées alimentaires.

"Ces questions, pour le dire dès le commencement, n'ont pas encore été résolues expérimentalement d'une façon complète.

"Mais tout ce que nous savons sur la nature du microbe en question nous donne le droit de supposer qu 'une multiplication considérable ne peut pas avoir lieu ni dans le sol superficiel ni dans l'eau, ou tout au

moins, un tel développement ne se produit que sous des conditions spéciales, qui en nature sont très rarement données. Dans les couches profondes du sol, un développement doit, d'après nos connaisances, être considéré comme impossible.

**The bacillus requires a rich medium and is very susceptible to the action of saprophytic microbes.**

"Le bacille est assez prétentieux et très exigeant quant à ses substances nutritives ; il demande un milieu riche pour son développement. D'autre part, il semble très susceptible contre la concurrence, comme les microbes pathogènes en général, des microbes saprophytes dont toujours des quantités énormes pullulent dans le sol et dans l'eau.

"Les bacilles que Yersin a trouvés, dans le sol à Hong-kong à 7 pouces de profondeur ne semblent point avoir été les bacilles de la peste. D'après Lawson leurs caractères morphologiques furent différents et, chose à remarquer, ils ne furent point pathogènes pour des animaux.

**Latrines and drains unfavourable to the life of the bacillus.**

"La susceptibilité pour la concurrence d'autres bactéries ne permettra guère au bacille de la peste de pousser ou même rester longtemps vivant dans les latrines ou les égouts. Ici, en outre la production considérable de carbonate d'ammoniaque aura une influence délétère sur le bacille très susceptible contre un excès d'alcali. D'après tout vraisemblance, il périra très vite dans les vidanges. Il y a un autre fait que je pourrai citer en faveur d'une telle opinion. Parmi es 2,000 vidangeurs employés par la municipalité de Bombay, il y a eu très peu de cas de peste, moins même que l'on ne pourrait les supposer, dans un milieu de personnes vivant dans des conditions misérables de la basse classe de la population.

"Or, ces gens, par la nature du système de vidange qui est en usage à Bombay, devaient forcément contaminer leurs mains et leurs vêtements tous les jour, par des déjections, et il ne peut exister de doute, qu'assez fréquemment des déjections provenant des pestiférés ne se soient trouvées dans les récipients à vider.

**The bacillus perishes in corpses.**

"Le microbe ne saurait guère non plus pousser dans les cadavres enterrés. Il est presque certain qu'ils périssent assez vite dans les cadavres.

**Possibility of development in food-stuffs.**

"Un développement sur certaines denrées alimentaires, doit être admis comme possible, mais il semble que nous n'avons pas à nous préoccuper beaucoup d'une possibilité pareille, parce que, selon toute vraisemblance, les aliments ne jouent pas un rôle appréciable dans la transmission de la maladie.

* * * * * *

**Retention and loss of infective property of bacillus.**

"Après avoir constaté que les microbes de la peste ne peuvent pas se multiplier en dehors de l'organisme d'une manière ayant une importance pratique, il faut maintenant que nous rendions compte sur le temps pendant lequel ils peuvent garder leur infectiosité, et sous quelles conditions ils la perdent.

Les recherches qui ont été faites jusqu' à présent à cet égard, sont assez incomplètes. Ce que nous savons pourtant, c'est que le bacille est assez susceptible contre le *déssèchement*. Je n'ai pas pu contreprendre des essais suffisants de ce genre, en raison de ce qu'ils exigent un matériel plus complet que je n'avais à ma disposition à Bombay.

The bacillus is susceptible to dessication.

"Quelques expériences faites par Kitasato ont eu pour résultat que le bacille était mort après quatre jours de déssication et qu'il y est également tué par une exposition au soleil durant plusieurs heures. Les quelques essais que j'ai pu faire m'ont convaincu également d'une façon absolue que le bacille ne peut persister à l'état sec que pendant quelques jours.

"Ce fait est d'une grande importance pour la propagation de la peste. Il le rend très invraisemblable que le germe pourrait être transporté à longues distances par l'air dans la poussière, et nous permet de supposer que les matières infectieuses qui sont jetées sur la voie publique y soient rendues inoffensives assez vite par la force combinée du déssèchement et des rayons du soleil.

"D'un autre côté, il est très probable de prime abord (les quelques expériences que j'ai faites venant à l'appui d'une telle opinion) que le bacille puisse conserver sa viralité pendant un laps de temps plus ou moins long, quand il se trouve à l'état *humide*, fixé sur des vêtements, dans la literie, etc, et sur le sol et les cloisons des chambres. Il y conservera sa virulence d'autant plus longtemps, qu'il sera protégé contre un déssèchement complet. Il ressemble à ce point de vue au bacille du choléra, qui peut, comme nous le savons, se tenir vivant pendant un temps considérable sous des conditions pareilles; seulement le microbe de la peste est encore plus résistant.

The bacillus can probably retain its vitality for a considerable period if kept moist and in a favourable medium.

"Si nous résumons brièvement ce que nous venons de dire, la valeur relative des sources d'infection créées par le pestiféré doit être apprèciée comme suit :

"*Le plus grand danger est le malade lui-même ; ses vêtements et sa literie souillés, et la chambre dans laquelle il se trouve.*

The greatest danger is from the sick person, his clothes, bedding and chamber.

"Les bacilles qui viennent dans les latrines, dans les égouts, sur la voie publique, etc., jouent un rôle bien secondaire dans le propagation de la maladie, et les cadavres enterrés peuvent même être considérés comme inoffensifs."

The result of the investigations of the German Commission (of which Professor Koch was a member) was similar in effect to Dr. Bitter's conclusions. The following summary is taken from the "Deutscher Reichs-Anzeiger und Königlich Preuszischer Staats-Anzeiger" of the 20th July :—

Investigation of the German Commission.

"Outside of the body of man or of the bodies of certain animals the plague bacillus shows a notable tendency to perish. Pure cultivations

Outside the bodies of man and certain

animals the bacillus shows a notable tendency to perish.

of the plague bacillus from different sources and of different ages in fluid or on solid media were found to be quite dead after 15 minutes' continuous exposure to a heat of 70°C. When the heat was 80°C., five minutes was enough for sterilisation. A cultivation suspended in water, when examined immediately after exposure to 100°C.,* was found to contain no living plague bacilli.

* * * * * *

Experiments of the German Commission.

"Material containing the plague bacilli was placed in different ways upon linen, wool, silk stuff (and also threads), gauze, filter paper, pieces of glass, earth, etc., kept in different conditions, and tested from time to time as to its infectiousness. The life of the bacilli under these circumstances was at most eight to ten days, and often only two to five days. Suspended in ordinary pipe-water the bacilli were found to be dead at the latest in three days; in sterile bilge-water after five days; in sterile pipe-water at the latest after eight days. The infectiousness of bacilli on the dried skin of two mice that had died of plague was extinguished in the one case on the fourth, and in the other on the sixth day. Sputum of plague pneumonia, containing large quantities of plague bacilli, and kept fluid in a test tube, closed with a cotton wool plug, in the ice-box, proved to be still infectious on the tenth day, but on the sixteenth day had ceased to be so. In all these experiments the plague bacilli showed themselves to be organisms which cannot grow without access of atmospheric oxygen."

Experiments on the vitality of the bacillus in grain, seeds, wool, cotton, and jute made by Mr. Hankin.

Mr. Hankin† also made a series of experiments in Bombay to test the vitality of the plague bacillus in grain of different species and in other food-stuffs, and in wool and similar commodities.

Conclusion that the infectious powers are lost in not more than six days.

Mr. Hankin injected into mice extracts prepared from grain infected with (i) pure cultures of the bacillus, (ii) portions of the organs of deceased rats and mice, (iii) secretions of the human patient. The conclusions at which Mr. Hankin arrived were that the bubonic microbe derived from pure cultures perished within thirteen days after being added to the specimens of grains and seeds employed, and that grain infected with the organs of animals dead of the plague or the sputum of a human patient loses its infectious powers within six days. In so far as Mr. Hankin was able to complete his investigation into the vitality of the bacillus in wool and other such commodites, he considered that the results tended to show that the bubonic microbe, whether derived from cultures or the organs of deceased animals, and whether placed on cotton, or sheep's wool or gunny cloth, uniformly dies out within six days.

* 212° Fahrenheit.

† Appendix I.

But the Government of India were advised that these laboratory experiments, though they may demonstrate the loss of pathogenic property, are inconclusive as demonstrating the loss of vitality in the bacillus, which might quite conceivably, although non-pathogenic at the time of the final experiments, again become pathogenic under favourable local conditions.

**These laboratory experiments not conclusive as demonstrating the loss of vitality in the bacillus.**

Dr. Bitter remarks that it seems probable that in a moist condition the bacillus may retain its vitality for a considerable time in surroundings favourable to its life, such as contaminated clothing or bedding, and experience favours this view. Hirsch recites an example from the epidemic at Wetljanka in 1878-79. There was a girl of ten years of age in the house of whose parents a box of clothing had been deposited, coming from a house in which all the inhabitants had died two months previously. The girl opened the box, which up to that time had remained untouched and was about to be burnt. She took a piece of clothing out and set to work on it, and four days later, the epidemic having disappeared, the first symptoms of the disease showed themselves in her.

**Experience pointing to conservation of vitality. Example from Wetljanka.**

Another interesting instance occurred on board a liner during the Bombay epidemic. The vessel embarked her crew at Bombay on the 20th August and anchored in the Thames on the 11th September. There were from three to four hundred passengers on board, and during the voyage there was no suspicion of plague among them or among the crew. On the 26th or 27th September one of the Indian Portuguese stewards fell ill and died on the 3rd October. Clinical and bacteriological evidence pointed to plague. Another of the stewards who slept in the same cabin as the first was also taken ill about the 26th September and died on the 27th before he could be removed to hospital. The result of a careful enquiry was to the effect that the infection was derived from clothing contained in bundles which remained unopened until the end of the voyage.

**Instance on a liner during the Bombay epidemic.**

Both the German Plague Commission and Mr. Hankin made experiments to test the action of chemical disinfectants on the plague bacillus. The following is a summary of the conclusions of the German Commission :—

**Action of chemical disinfectants.**

"A solution of corrosive sublimate of the strength of 1 : 1,000 killed the bacilli at once. Carbolic acid or lysol of the strength of 1 in 100 killed the bacilli within 10 minutes. When suspensions of the bacilli were treated with soft soap (3 in 100) or chloride of lime (1 in 100), they were found after 5 minutes still to contain virulent bacilli, but in 15 minutes sterility had been produced by the chloride of lime, and in 30 minutes by the soap. Sterilised fæces copiously infected with plague bacilli, and then mixed with equal parts of ordinary milk of

**Experiments of the German Commission.**

lime, contained virulent bacilli after 30 minutes, and had become sterile in an hour. The plague bacilli were found to be extremely sensitive to mineral acids; for the plague bacilli contained in the mixture were killed in less than 5 minutes by pure sulphuric acid diluted to 1 : 2,000. Bacilli dried in thin layers on splinters of glass and exposed to direct sunlight died within an hour."

**Experiments of Mr. Hankin.**

Mr. Hankin's researches on the action of disinfecting agents were to the following effect :—

"A. *Phenols and their allies.*—The bubonic microbe was found to be somewhat resistant to the action of carbolic acid, a one per cent. solution not being always sufficient to kill it under the condition of the experiment. Phenyle, lysol, and izal were found in all cases to destroy the microbe when in a quarter per cent. solution. The limit of dilution of the solutions of these substances necessary to destroy the microbe was not however found. Naphthaline, both pure and impure, and a patent preparation 'naphtho-sublimate' were found to exert no disinfectant action although tested in solutions containing an undissolved excess of these substances.

"B. *Corrosive sublimate and copper sublimate.*—Corrosive sublimate was found to destroy the microbe in a strength of one in five thousand, but the lower limit of its action was not investigated. Copper sulphate was found to be efficient in a strength of one in a thousand. A five per cent. solution of this substance was used by the French Government in 1892 in combating cholera. It is easily obtainable in India, and might under certain conditions be used against the plague as shown by the above result.

"C. *Alkalies.*—The microbe appears to be relatively resistant to the action of alkalies including ammonia, caustic potash, and freshly slaked lime. Under the conditions under which lime washing must be carried out in India, it must not be regarded as a disinfectant for the infection of bubonic plague.

"D. *Acids.*—The microbe is extremely sensitive to the action of acids. The sensitiveness is greater in the case of inorganic acids, but certain organic acids were also found to destroy the microbe rapidly. The following results were obtained :—

*With inorganic acids.*

Under the conditions of the experiments the microbe was destroyed in five minutes by—

Nitric acid of a strength of 1 in 133.
Hydrochloric acid of a strength of 1 in 500.
Sulphuric acid of a strength of 1 in 1,429.

A mixture of four parts of sulphuric acid and one part of nitric acid was found to be as efficient as sulphuric acid in destroying the plague microbe.

*With organic acids.*

The microbe was destroyed in five minutes by—

Formic acid of a strength of 1 in 100.

Acetic acid of a strength of 1 in 142.

Lactic acid in a strength of 1 in 333.

"E. *Reducing agents.*—The microbe was found to be extremely resistant to the action of ferrous sulphate, a substance that has been frequently recommended for the treatment of sewage and filth. It appears generally to die out when evaporated to dryness in a thin film on glass in the presence of the air, but was found still alive after five days when evaporated to dryness in glass bulbs in a current of hydrogen gas.

"F. *Oxidizing agents.*—The microbe was found to be destroyed by a solution of one in ten thousand of chloride of lime, but the lower limit of the action of this substance was not detected. Permanganate of potash was found to be capable of destroying it, under the artificial conditions of my experiments, in a dilution of 1 in 50,000, that is to say, in a solution in which the pink colour is but faintly marked. In certain cases it appeared that the organic matter present was sufficient to destroy all the permanganate used, after the lapse of some hours. In these cases the microbes were first destroyed and afterwards the permanganate was reduced. It was shown however by experiment that the quantity of readily reducible organic matter present on a cowdung floor is so great that probably a four per cent. solution of permanganate would be necessary to produce a safe disinfection."

Laboratory conditions favourable to the action of the disinfectant.

Mr. Hankin recognised that the conditions under which the laboratory experiments were carried out were probably more favourable to the disinfectant than would be the case in practice. "This fact while tending to justify the condemnation of a disinfectant from the results of such experiments, necessitates caution in using such experiments to recommend a disinfectant. The fact that a disinfectant can destroy a microbe suspended in water, as was the case in my experiments, does not prove that it would be capable of destroying the microbe when contained in human dejecta soaked into a cowdung floor. Hence it appeared to me to be advisable to carry out some experiments in which practical conditions would be more closely imitated."

In pursuance of this view Mr. Hankin made a series of interesting experiments on the floors of houses, which are described in Chapter VIII in dealing with the subject of disinfection, and which are reproduced in Appendix VI.

**Vitality of bacillus in food-stuffs and dead bodies from point of view of susceptibility to action of organic acids.**

Mr. Hankin made the following interesting deductions regarding the vitality of the bacilli in food-stuffs and dead bodies from its susceptibility to the action of organic acids:—

"In view of the fact that most articles of diet either possess an acid reaction or rapidly acquire it on the onset of decomposition owing to the appearance of the above acids or their allies, it seems scarcely probable that food-stuffs should retain for long the microbe of bubonic plague. In the case of milk this speculation has been put to an extended test by Dr. Srinivasa Rau in my laboratory in Bombay. He found that as soon as milk has been kept long enough to acquire a well marked acid reaction, that is to say, within a few hours of milking under ordinary conditions, it has the power of destroying the bubonic microbe within an hour. If, on the other hand, the milk is made faintly alkaline, it is incapable of so doing, and appears to be a good food medium for the bubonic microbe. Dr. Rau has also carried out experiments on the vitality of the bubonic microbe in rotten grain. This substance nearly always has an acid reaction, and is then capable of rapidly destroying the bubonic microbe. I propose to describe his experiments at length in another report. The tissues of animals after death acquire an acid reaction owing to the development of an ally of lactic acid. Dr. Rohak under my direction has found that this acid reaction appears in the bodies of animals dead of plague. This point, though it has no bearing on the admitted danger of handling and washing plague corpses, may, if worked out, be found to have an important bearing on the old idea that graveyards may be a lasting source of infection."

## Mode in which the Bacillus enters the System.

**Scheube.**

Scheube states that infection can take place by the air or touch, and consequently the poison may gain access to the body by the respiratory organs or by the skin.

**Hong-kong observers.**

Among the observers of the Hong-kong plague Surgeon-Major H. E. R. James states that the bacillus so far as is known gains access by (*a*) respiration, (*b*) inoculation and (*c*) food. Staff Surgeon Wilm expressed the opinion that infection through the skin is not common; "for, on the one hand, in the great majority of cases the buboes do not appear

until after the onset of severe symptoms; and, on the other hand, were such a mode of infection common, we should expect to see much more frequently local affections of the skin, since the plague bacillus when injected into animals usually causes intense inflammation with a hæmorrhagic gelatinous exudation." "The plague bacillus appears to enter the body," says Staff Surgeon Wilm, "most frequently by way of the alimentary tract. This view is substantiated by the result of experiments on animals, and by these cases in which, both during the occurrence of the disease and on the *post-mortem* table, the principal changes were found to be in the stomach, the mesenteric glands, and the other abdominal organs." This opinion and these observations differ widely from the results of the investigations pursued at Bombay.

Dr. Bitter.

Dr. Bitter deduced the following conclusions from his experiments:—(*a*) In all cases in which the buboes appear in the lymphatic glands of the extremities (*e.g.*, inguinal, femoral and axillary), the germ of infection enters through a discontinuity in the skin. (*b*) In some cases where buboes appear in the cervical glands the infection may take place through the tonsils. (*c*) Infection may sometimes take place through the intestinal tract, the primary infection occurring in Peyer's patches, the solitary follicles, or the mesenteric glands. (*d*) In primary pneumonic cases the infection occurs through the lungs.

Infection through—
(*a*) The skin.
(*b*) The tonsils.
(*c*) The intestinal tract.
(*d*) The lungs.

Arguments on which Dr. Bitter's conclusions are based.

The following are the arguments on which Dr. Bitter bases these conclusions:—

"Il ne peut exister le moindre doute que dans les cas buboniques simples et dans les cas septicémiques, les bubons ne représentent réellement la localisation primaire, le premier foyer de développement pour le bacille spécifique. Tant les observations faites sur le vivant que les résultats des autopsies parlent entièrement en faveur d'une telle supposition.

"Mais les bacilles comment entrent-t-ils dans les bubons?

"Les sièges des bubons primaires sont la région fémorale et inguinale, cubitale et axillaire, et enfin la région cervicale. Les groupes des glandes lymphatiques qui se trouvent dans ces endroits, reçoivent les vases lymphatiques d'une certaine région, et constituent pour ainsi dire les passeirs par lesquelles la lymphe doit être filtrée avant d'entrer dans le système lymphatique intérieur. Ainsi, par exemple, les glandes fémorales et inguinales appartiennent à l'extrémité inférieure, les glandes cubitales et axillaires au bras. Une fonction principale de ces glandes est certainement de servir comme une espèce de barrière pour arrêter les éléments corpusculaires nuisibles, surtout des bactéries, qui essayent d'envanir l'organisme par la voie lymphatique de la périphérie.

"Lorsqu'une ou plusieurs glandes d'un seul groupe se gonflent, s'enflamment ou arrivent au degré de suppuration, la cause en est presque régulièrement une lésion infectée qui se trouve dans la peau de la région périphérique correspondante. C'est là une ancienne expérience médicale; ces glandes gonflées portent comme dans la peste le nom de *bubons*.

"Nous observons également que parfois dans ces cas, les bactéries ne restent pas confinées dans les glandes, mais qu'elles franchissent la barrière et créent une infection générale de l'organisme. Les infections bien connues causées par des streptocoques pourraient servir d' exemples pour ce que je viens de dire.

"Or, l'analogie avec les altérations créées par la peste saute aux yeux. Aussi dans cette maladie, ce ne sont, dans le plus grande majorité des cas, qu'une ou plusieurs glandes appartenant à un seul groupe, qui montrent les affections spécifiques. Rien n'est donc plus naturel que de supposer qu'également ici, l'entrée des bacilles a lieu par le périphérie.

**Infection ordinarily through a discontinuity of the skin.**

"Comme toutes nos expériences bactériologiques sont contraires à l'idée que le bacille puisse traverser le peau intacte, la porte d'entrée ne pourrait être qu'une petite plaie. En effet, si nous prenons en considération toutes les possibilités qui exissent pour le transport dans les glanders primaires, des bacilles spécifiques, nous arrivons à cette conclusion, que dans tous les cas de peste, où les bubons primitifs se trouvent dans les groupes de glandes lymphatiques des extrémités, le germe infectieux a fait son entrée par une discontinuité de la peau de la région périphérique en question. On ne pourrait guère trouver une autre explication plausible, étant donné le fait que les glandes spécifiquement affectées, sont la localisation primaire.

"Parfois, j'ai rencontré une idée vague que le bacille entrait par les voies respiratoires ou digestives, et qu'il était de là transporté dans la glande primaire.

"Ce transport devrait se faire on par là voie lymphatique ou par celle du sang. En admettant le première possibilité, il serait très difficile, si non impossible, d'expliquer pourquoi là localisation primaire aurait justement lieu dans les glandes périphériques et non pas, comme il serait naturel, dans les glandes mésentériales ou bronchiales, et pourquoi l'infection est presque toujours restreinte à un seul group anatomique des glandes. Aussi le transport par le sang est tout à fait invraisemblable. En entrant dans le système vasculaire, les bacilles devraient ou s'y multiplier, comme ils le peuvent, ou tout au moins la localisation primaire devrait se faire dans la rate, qui est spécialement apte à retenir des bactéries comme nous le savons, tant d'autres maladies infectieuses que de la forme septicémi-

que de la peste même. Une fois entré dans les poumons, le bacille de la peste ordinairement ne manquera pas de produire les altérations pneumoniques mentionnées plus haut.

"La théorie *de l'infection à voie indirecte* est donc tout autant contraire aux faits anatomiques qu'aux habitudes des bacilles spécifiques. Theory of indirect infection not tenable.

"Ce qui, à première vue, ne semble pas bien se ranger à l'idée d'une infection cutanée c'est que dans beaucoup de cas de peste, on ne trouve pas de plaies constituant la porte d'entrée du bacille, ce qui est presque toujours possible dans les cas analogues causés par d'autres bactéries. Ces dernières, créent ordinairement une réaction plus ou moins forte à la porte d'entrée, que l'on peut même très souvent suivre le long des vaisseaux lymphatiques jusqu'aux glandes gonflées. That the wound is often not discoverable does not disprove theory of infection through a discontinuity in the skin.

"Le bacille de la peste, de son côté, ne produit que très rarement une altération locale. Il ne commence à se multiplier et à provoquer une réaction que dans les glandes.

"Comme la discontinuité de la peau qui lui a servi de porte d'entrée peut être tout à fait minime, elle pourrait être bien guérie au moment où les symptômes glandulaires deviennent manifestes et à échapper ainsi à l'observation.

"Quand on examine du reste bien la peau, on trouve dans une grande partie des cas de peste, assez d'égratignures et de discontinuités dans la région du corps correspondant au bubon, qui auraient pu servir de porte d'infection.

"Enfin, l'infection par voie de petites plaies, a été observée plusieurs fois d'une façon directe et incontestable. Plusieurs anatomistes pathologiques qui se sont piqués le doigt en faisant l'autopsie d'un pestiféré, ont contracté par cela la maladie, et les bubons se trouvèrent dans l'aisselle correspondant à la lésion.

"Il existe du reste des maladies où l'infection a certainement lieu par de petites discontinuités de la peau et dans lesquelles on ne réussit que très rarement à prouver leur présence. Ainsi, par exemple, dans l'érysipèle à la face qui règne parfois d'une manière épidémique. Ce n'est que la bactériologie moderne qui a tracé dans cette maladie la voie d'infection. Dans le temps on l'appelait souvent *érysipèle idiopathique* pour le distinguer des érysipèles chirurgicales, où on reconnaissait facilement une plaie comme porte d'infection.

J'ai vu à Bombay deux cas qui montrèrent l'affection primaire dans les glandes cervicales profondes. Les altérations constatées à l'autopsie, le rendirent des plus probables que l'infection eut pris son origine des tonsilles. Cela n'a rien d'étonnant, si nous nous rappelons Infection through the tonsils.

que les lacunes des tonsilles sont en communication directe et ouverte avec le système lymphatique du cou. Il est bien probable que dans un certain nombre de cas de bubons cervicaux, l'infection se produit de cette manière.

**Infection originating in the intestinal track.**

"De même, une infection prenant son origine de la voie intestinale, n'est pas impossible. Dans un cas pareil l'affection primaire devrait se trouver ou dans les plaques de Payer ou dans les follicules solitaires ou bien dans les glandes mésentériales.

"Les observateurs qui ont fait des autopsies à Hong-kong, prétendent avoir vu souvent des formes pareilles. Wilm, est même d'opinion que l'infection par l'intestin est la plus fréquente. A Bombay, je n'ai jamais constaté une forme semblable ; aucune autopsie n'a relevé des faits qui parlent en faveur d'une infection intestinale.

"Dans les cas que j'ai examinés, j'ai vu, c'est vrai, parfois les glandes mésentériales gonflées, mais il ne s'agissait pas là du gonflement spécifique qui est caractéristique pour les glandes primaires. Dans tous ces cas, du reste, la localisation primitive put être constatée ailleures. Aussi, les autres observateurs, qui ont étudié la peste à Bombay et qui ont fait beaucoup d'autopsies, m'ont assuré qu'ils n'ont jamais vu de cas intestinaux.

"Je ne saurais expliquer pour quelles raisons les observateurs de Hong-kong ont une opinion différente, mais d'après tout ce qui a été constaté à Bombay, tant par les autres observateurs que par moi, je me crois autorisé de dire que l'infection par voie intestinale n'a joué à Bombay aucun rôle, ou au moins un rôle tout à fait secondaire.

"Il n'est pas bien probable que dans deux épidémies de la même maladie, sévissant dans différents endroits, le mode principal d'infection puisse être tellement différent comme il le serait, si l'on admettait que tant les observations faites à Bombay que celles rapportées de Hong-kong par Wilm, soient exactes.

**Infection in the lungs.**

"Mais il existe une autre voie d'entrée bien souvent fréquentée par le bacille de la peste, c'est *l'infection par inhalation ou mieux par aspiration dans les poumons.* Dans ces cas là, la localisation primaire se trouve dans les poumons sous la forme de foyers pneumoniques disséminés. D'après ce que nous avons vu plus haut, ces foyers constituent réellement la première lésion, et il ne peut pas exister le moindre doute que l'infection ne doive réellement son origine à l'entrée directe des bacilles spécifiques dans les poumons."

**Intestinal infection.**

With regard to Dr. Bitter's observations about intestinal infection it has been stated above that the gastro-endemic form of plague, though rare, did exist in Bombay as a primary type.

Messrs. Wyssokowitz and Zabolotny of the Russian Commission came to a similar conclusion with regard to infection by direct inoculation, as will be seen from the following quotation :—

Experiments of the Russian Plague Commission with regard to infection through the skin.

"En faisant les autopsies, il était difficile de reconnaître par quelles voies le virus avait pénétré soit dans les glandes, soit dans les poumons. Presque dans tous les cas on ne trouvait ni lésions locales de la peau, ni modifications des vaisseaux lymphatiques (lymphangites). Et cependant, on devait supposer la pénétration du virus par la peau : il était nécessaire de prouver cette proposition. Nous avons trouvé des arguments en sa faveur dans les *expériences faites sur les singes.* En effet, des expériences préliminaires sur les singes nous ont montré que ces animaux sont très sensibles au virus de la peste.....

"D'après nos expériences, nous sommes persuadés que les singes prennent toujours la peste après qu'on les a infectés. Nous avons fait quelques expériences avec des doses très minimes de bacilles, au moyen d'une simple piqûre faite avec une épingle chargée de virus. Tous les singes (5) infectés de cette façon à la paume de la main sont morts, après 3 à 7 jours, avec des bubons et tous les autres symptômes de la peste, mais dans ce cas on n'observait, ni pendant le cours de la maladie, ni à l'autopsie, aucune alteration sensible à la place de l'introduction du virus, à la paume de la main.

"Chez un singe infecté au pied dans les mêmes conditions par une piqûre d'épingle, la mort n'est survenue qu'après un temps plus long (10 jours) avec des bubons inguinaux et rétropéritonéaux très manifestes, absolument comme chez l'homme, mais toujours sans lésions locales au point d'inoculation.

"Les résultats de ces expériences sont très intéressants parce qu'ils ne laissent pas de doute sur ce point que, chez l'homme, l'infection par la peau peut se développer sans qu'il y ait aucune lésion apparente au point d'introduction du virus."

Dr. McCabe Dallas on the mode of infection.

Among the medical officers of the Government who studied the plague, Dr. McCabe Dallas (Grant Road Hospital, Bombay) discusses the mode by which the bacilli gain an entrance into the system and produce the disease. He states that the current conclusions are that the infection occurs through wounds, abrasions, or other openings of the skin or mucous membrane, through the lungs or by way of the alimentary canal. He explains the theory of these conclusions in somewhat the same way as Dr. Bitter, but states that there are objections, the chief among which he appears to consider the difficulty,

mentioned by Wilm and combatted by Dr. Bitter and the members of the Russian Commission, of believing that the germ can in the majority of cases enter the system through a discontinuity of the skin.

**Dr. Wilkins on the mode of infection.**

Surgeon-Lieutenant-Colonel J. S. Wilkins, who was in charge of the operations against plague at Cutch-Mandvi, made the following interesting remarks, in which he states a view in many ways similar to that put forward by Dr. Bitter :—

"There are several means of conveyance :—

1. By the air, producing the very common and fatal form of *primary plague pneumonia.*
2. By the food or drink (*acute plague dysentery*).
3. By the skin.

**Infection by the skin.**

"I am inclined to think that the latter method is far commoner than is generally supposed, especially amongst cases affected with buboes. Out of the following 260 cases . . . it has been found that there were—

| | |
|---|---|
| No buboes... ... ... ... ... | 94 |
| Right inguinal ... ... ... ... | 60 |
| Left „ ... ... ... ... | 58 |
| Right axillary ... ... ... ... | 19 |
| Left „ ... ... ... ... | 11 |
| Submaxillary ... ... ... ... | 7 |
| Cervical ... ... ... ... ... | 1 |
| Supratrochlear ... ... ... ... | 1 |
| Parotid ... ... ... ... ... | 1 |
| Multiple ... ... ... ... ... | 8 |

"From the above it will be seen that by far the largest number of buboes affected the groin. The explanation of this appears to be that the large majority of Cutchees wear no protection to the feet, and it is perfectly easy to understand that, under these circumstances, ever so slight an abrasion of the superficial epithelium (an unavoidable occurrence in a barefooted race) would provide a mode of entrance to the bacillus followed by an inflammatory condition of the nearest glands.

"The same principle applies equally to other parts of the body. The next largest number to the inguinal are the axillary, the right axillary nearly double the left, because the right hand is not only used more than the left, but is almost exclusively used in eating.

"The submaxillary becomes infected by the entrance of the bacillus through a carious tooth, the supratrochlear from the hand, and the

parotid through Stenson's Duct. The cases fairly illustrate the frequency of direct inoculation, which in the present state of our knowledge should come under the old head of contagion."

## The Plague and Animals.

Plague attacks certain classes of animals.

Plague differs from other infectious diseases, such as typhus, typhoid and cholera, in that it is not confined to man but also attacks certain classes of animals.

Rats.

The occurrence of a marked mortality among rats either anterior to or coincident with plague epidemics is a well-known phenomenon that has been observed from distant times and in many lands. It has been a marked characteristic of plague visitations in India including the present epidemic. An examination of the bodies shows buboes similar to those which exist in man, and bacteriological investigations in Hong-kong and India have demonstrated the existence in large quantities of the plague microbe in the bubo and in various portions of the organism of the dead animals. There is no doubt that rats are in a high degree susceptible to plague.

Inoculation with bubonic pus causes certain death, not only to rats, but also to other small rodents, such as mice and guinea-pigs. Mice die after one to three days, and guinea-pigs after two to five days. Numerous bacilli are found in the lymphatic glands, the spleen, the liver and the blood. Inoculations from cultivated bacilli are also successful.

The following were the conclusions of the German Commission on the subject of plague in rats:—

Observations of the German Plague Commission on plague in rats.

"A rat which had become infected while in a state of freedom contained in its body a very great number of plague bacilli; and altogether, as later researches proved, rats showed themselves in a high degree sensitive to plague infection. Simple inoculation with the smallest quantities of a cultivation, or contact of the external mucous membranes with a cultivation, or feeding with the smallest quantities of a plague bacillus cultivation was enough to produce invariably fatal plague. Since it is known that these animals in a state of freedom are accustomed to gnaw the bodies of their companions dead of plague, it is easy to understand that the pestilence must spread very quickly among them and destroy the whole rat-population of a place, and that by means of rats the plague germs can be introduced from one home into another and conveyed to men."

**Remarks of the Technical Committee of the Venice Sanitary Convention on plague among domestic animals.**

The Report of the Technical Committee of the Venice Sanitary Conference of 1897, after dealing with the small rodents, discusses the case of the domestic animals in the following terms:—

"D'autres espèces encores vivant au voisinage de l'homme, à l'état domestique, les chiens, les porcs, les buffles, les moutons, les chèvres, etc., peuvent être atteintes d'après certains observateurs. Jusqu'ici cependant, aucune preuve directe n'a été fournie de la communauté d'origine de la peste et de certaines épizooties, qui ont, parfois régné simultanément."

**Experience of present plague shows that susceptibility of domestic animals is very slight.**

The Government of Bombay consulted their expert advisers with a view to ascertain what danger existed of domestic animals being attacked by plague. The investigation was made specially with a view to determine whether any risk of infection was to be apprehended from animal lymph prepared within plague areas. The result was distinctly unfavourable to the hypothesis that domestic animals are under ordinary conditions susceptible to plague. The Government of Bombay summed up the conclusions in the following passage:—

"It is in fact very doubtful whether cattle are susceptible to plague, at all events to anything like the same degree as human beings. There has been no record of any disease or deaths among cattle in the many places where the epidemic has raged in the Bombay Presidency which could be attributed to plague; and, as will be seen from Dr. Lowson's report, in Cutch-Mandvi inquiry has shown that cattle remained perfectly healthy while the plague was at its worst in that town. The so-called cases of plague in cattle have, at least in one instance, been pronounced by competent veterinary opinion as rinderpest. Dr. Lowson reports that he carried out experiments in Hong-kong in conjunction with the Colonial Veterinary Surgeon, in which it was proved that cattle, after direct inoculation with pure culture of plague bacilli, did not develop plague, and, with the exception of temporary fever and refusal of food, remained healthy. Moreover plague bacilli could not be found microscopically or bacteriologically in their blood, nor were there any signs of plague, such as enlarged glands, along the chain of lymphatics from the spot where the inoculation was made. M. Haffkine's experiments in Bombay, like Dr. Lowson's in Hong-kong, tend to prove the immunity of cattle generally from plague. M. Haffkine injected hypodermically horses, goats, cows and sheep with considerable doses of virulent plague cultures. The operation caused an attack of fever from which they all, except the goats, recovered in a short time with perhaps local swelling and suppuration at the seat of inoculation. The goats alone, without developing any acute disease, lost condition, gradually wasted away, and after a considerable time many of them succumbed. He further

**M. Haffkine's experiments.**

states that one of the cows gave birth to a calf during the period she was operated on, and both cow and calf remained healthy. Finally, M. Haffkine considers that his experiments show that no spontaneous plague infection, which in nature can only take place with much smaller doses of virus than those used by him on horses, cows, goats and sheep, is likely to affect these animals; and the Surgeon-General concurs in this opinion."

Researches of the German Plague Commission.

The researches of the German Plague Commission were equally satisfactory. The following is a summary of their conclusions:—

"Pigeons, fowls, geese, and pigs were treated with injections of virulent, concentrated suspensions of plague bacilli, and the pigs were also in part fed with rats dead of plague; but none of them showed any reaction whatever. Injected or inoculated dogs gave almost no reaction. Of two dogs fed with pure cultivations, one remained well, the other became slightly ill, but no plague bacilli were found in the swollen glands. Injected and inoculated cats had short fever. In one case a local abscess formed, but the pus was sterile. Somewhat more sensitive to inoculation or injection were sheep and goats; in the case of the former the abscess-pus contained numerous plague bacilli; in the case of the latter, none. Cows reacted with high fever and severe local appearances; in this case also the abscess-pus was free from plague bacilli. Horses showed less reaction. All the animals experimented on that showed signs of illness have completely recovered. It is to be noted that in these experiments with animals the exhibition of the infection was far more intense than obtains under natural conditions."

Confirmatory evidence from Kumaun and Garhwal.

The experience of the Himalayan plague in Kumaun and Garhwal affords further evidence that domestic animals are not susceptible to the disease. In the Himalayan villages cattle and men are crowded together in ill-ventilated tenements. The cattle with the people are thus subjected to conditions peculiarly favourable to the action of plague infection. Notwithstanding this, Dr. Rennie, who investigated the Himalayan plague in 1850, expressly remarked that the natives were all agreed that there had been no particular disorder of mortality among their cattle, but that the disease was preceded or accompanied by a great mortality among the rats in their houses.

Monkeys.

Monkeys, on the other hand, were found to be extremely sensitive to plague, and both the German and the Russian Commissions used monkeys for their experiments on the effect of preventive and curative inoculation. The members of the German Commission discovered that the grey monkeys were far more sensitive than the brown monkeys. It is believed that some monkeys died of plague during a slight

epidemic that prevailed at Kankhal near Hardwar in the North-Western Provinces.

**Insects.**

The German Commission observed that flies taken off the body of a rat and inoculated into a guinea-pig, infected it with plague. The possibility of infection being carried by flies and other insects has been noticed in some previous epidemics.

## Mode of Dissemination.

The facts narrated in the preceding sections regarding the dissemination of the bacilli from the sick, the behaviour of the bacillus in nature, the mode in which the infection enters the system, and plague among animals, lead up to the all-important subject of the manner in which the disease is disseminated.

**Primary danger is in the sick person and his surroundings.**

In the first place it will have become evident that the primary danger exists in the sick person and his surroundings, his clothing and bedding and other objects that may have been in contact with him, and the room in which he has resided. The general characteristics of the bacillus and in especial its apparent rapid loss of vitality in air and sunlight, and its power of thriving in the filthy media suited to it will have further indicated that the danger from these primary sources of infection must be infinitely greater in insanitary, ill-ventilated and overcrowded surroundings than in a wholesome and clean environment. In this fact lies the answer to the question to what extent the disease is infectious. In dirty, ill-ventilated and confined places the poison may attain to an extraordinary virulence, and has produced results which are recorded in some of the most appalling chapters of the history of mankind. But in more healthy and airy habitations the bacillus fails to find the conditions essential to its life and is at once robbed of its devastating power. Modern scientific research has disclosed the reason for this phenomenon, but the fact itself has been notorious for ages. Plague has always been recognised as intimately connected with poverty and filth, and in Europe, as the sanitary conditions of life became better, the disease, which once raged with irresistible violence, was observed to recede gradually but surely from the continent.

**Danger greatly enhanced by insanitary and overcrowded surroundings.**

**Hirsch's remarks on connection between plague and defective hygiene.**

Hirsch lays the greatest stress on this aspect of the question. He remarks as follows :—

" There is no point in the etiology of plague about which observers in all times and at every place have been so entirely in agreement, as that the origin and diffusion of the disease are closely connected

with the injurious influences of a *defective hygiene*, and particularly with domestic misery. Almost all the authorities on epidemics of plague in Europe during past centuries point to the accumulation of filth in the houses and in the streets, to defective disposal of fæcal matter, and other animal excreta, to overcrowding and insufficient ventilation of dwellings, and the like, as a real means of fostering the pestilence; they all urge the removal of these noxious influences as the most important principle of prophylaxis, and they all remark that the reason why the plague has mostly, and sometimes exclusively, attacked the poorer part of the population, is that among them the defects of social wellbeing are most felt."

Later observations including those made in India are to the same effect.

The same tale is told by those who have observed the disease in Egypt, Syria, Asia Minor, Turkey in Europe, Persia, Mesopotamia, and China, and India is not in the least an exception to the rule.

Dr. Whyte in his interesting account of the plague in Gujarat in the early part of the present century states in the most impressive manner his belief that the disease was in the highest degree fostered by insanitary conditions and that it might be combated by removing the people from these conditions into healthy surroundings.

Insanitary condition of the towns and villages which were the scene of the Pali plague.

Dr. Ranken's report on the Pali plague of 1836 mentions particularly the dirty and insanitary condition of the Rajputana villages. He quotes several extracts from the accounts of the local medical officers, of which the following will serve as an instance :—

"The town,* like most others in Marwar, is abundantly filthy, the cattle being either the actual inmates of a number of the houses, or pent in folds as close to them as possible. The collection of nuisances that this order of things gives rise to may readily be conceived, nor can we suppose the effect to be otherwise than injurious as regards the health of the inhabitants. Indeed, the most studied art could hardly devise a more effectual plan for rendering their nuisances every way offensive than that universally prevailing among the people of Marwar and Meywar. I mean the plan of running immensely dry hedges, composed of the branches of prickly shrubs, bushes, etc., not only round the town, as a defensive outwork, but into every crevice and corner where there may be possibility of egress or ingress either to man or animal."

Insanitary condition of the villages where the Himalayan plague is endemic.

In his account of the endemic plague in Garhwal and Kumaun (*Mahamari*) Dr. Hutcheson gives the following general description of the insanitary condition of the country :—

"Mahamari has been fostered by the uncleanly and filthy habits of the people of the hill tracts, who house cattle, sheep, goats and other

* Sumari.

animals on the ground floors of their unventilated houses and allow accumulations of sewage, refuse and litter in the immediate vicinity. They also defile and pollute the neighbourhood of the village in defiance of all sanitary law, and in their helplessness permit refuse and noxious weeds to fill the air with rank odours, adding to the foul emanation that penetrates every nook and corner of the overcrowded impure dwelling which forms a nursery of zymotic disease, and is the birthplace of the pestilence."

The inhabitants of these Himalayan tracts have become so impressed with the fact that the disease is fostered in their villages that it is their common practice to flee to the open when an outbreak occurs, thus, no doubt, saving many of their lives.

**The same lesson taught by the present epidemic.**

The history of the present epidemic given in subsequent chapters of this report teaches the same lesson. It will be shown how the disease broke out in a quarter of the city of Bombay where the overcrowded, dirty and ill-ventilated tenements presented conditions the most favourable for the growth of plague, and how it seized with irresistible violence on dirty and insanitary towns, such as Sukkur and Mandvi.

**Incidence of disease in Bombay City greatly due to local conditions.**

In a memorandum signed in the middle of January 1897 by some of the principal European and native medical practitioners of the city of Bombay and members of the Special Plague Research Committee appointed by the Government of Bombay, the opinion was stated that the disease then prevailing in the city was, under certain conditions, only slightly contagious or infectious, and that the facts observed in connection with individual cases and those associated with the general progress of the disease, warranted the conclusion that its incidence was greatly due to local conditions.

**Remarks by General Gatacre.**

General Gatacre, recorded the following remarks :—

"These and many other points taken in connection with the insanitary conditions in which the poorer, and in some particulars, even the wealthy, classes live, make the suppression of the epidemic in India a very difficult matter.

"It must be remembered that in all large oriental cities a very large proportion of the population are very poor and cannot afford to pay the rent of a really sanitary building ; they therefore are forced to live in miserable shanties, dark, low, small, and built on insanitary sites, without plinth, added to which, with a view to bringing the cost of this habitation to the lowest point, 16 or 20 persons will sleep, eat and cook in a space hardly sufficient for the requirements of four."

Surgeon-Captain Thomson (Parel Hospital, Bombay) observed that "fatigue, destitution, filth, poverty and overcrowding seemed to be the chief predisposing factors, and the horribly filthy condition of the person and clothing of most patients were indescribable." Dr. Thomson (Bombay City).

Dr. McCabe Dallas (Grant Road Hospital, Bombay) made the following remarks in describing the outbreak of the plague:— "There were the necessary heat and moisture present to encourage its culture, helped by the requisite material within the houses, which in most instances, were overcrowded, ill-ventilated, deficient in light, and inhabited by a class of persons who are generally opposed to the benefits of sanitation." Dr. McCabe Dallas (Bombay City).

In subsequent chapters other instances will be given of the fostering influence exerted by insanitary conditions, and indeed the examples might be multiplied without number, but enough has been said to show that it has been fully recognised in the present as in previous epidemics of plague that insanitary and filthy conditions play the chief part in fostering the spread of infection. Other instances given in subsequent chapters.

Important instances are also not wanting in the history of the present epidemic with regard to the reverse aspect of the question, serving to show how the existence of healthy conditions destroys the virulence of infection. In the first case there is the marked immunity enjoyed by Europeans. On this point Dr. Bitter has recorded the following interesting remarks:— Instances showing that healthy conditions destroy the virulence of infection.

"D'un autre coté, le nombre d'Européens atteints de la peste pendant l'épidémie, a été minime. Il y á eu en tout jusqu'à la fin du mois d'avril, 40 cas parmi une population de plus de 10,000. Il faut même considérer qu'une partie de ces cas est survenue chez des personnes pauvres, qui habitaient les quartiers indigènes. On ne pourrait guère expliquer ce fait, en admettant que la race européenne ait une prédisposition moindre pour la peste. On recontre des cas aussi graves et aussi rapidement mortels parmi les Européens que parmi les indigènes. Il est vrai que les Européens attaqués ont donné une mortalité considérablement plus faible que les indigènes, mais cela est certainment dú au fait que les cas légers qui sont suivis de guérison, chez les indigènes, échappent très souvent à l'observation. La seule explication raisonnable que l'on pourrait donner pour l'immunité relative des Européens, c'est que par leurs habitudes de vie, *ils sont mieux protégés contre l'infection.* Du reste, je ne connais pas d'exemple que dans une famille européenne de classe aisée il y ait eu *plusieurs* cas de peste." Immunity enjoyed by Europeans.

Next there is the important evidence of the non-infectious character of the disease in hospitals, and the comparative immunity enjoyed by the attendants on the sick and the persons, both European and native, Non-infectious character of the disease in hospitals.

engaged in the work of disinfection and other such operations, whose sanitary conditions were carefully supervised. General Gatacre remarks as follows:—

Remarks by General Gatacre.

"It is an interesting and highly satisfactory fact that remarkably few of the officers or employés engaged on plague work, and especially on disinfection, suffered from the disease. Of the coolies working within the city of Bombay who caught plague, only three or four are recorded; of the gangs sent to Cutch-Mandvi, five developed plague in the place itself and died, and three after they returned to Bombay while under observation. Of those sent to Colaba district, none are recorded as having taken the disease. But it is to be regretted that Dr. Desai, the Medical Officer in charge of the Hindu Hospital, and Dr. Dooda, in charge of the Dariastan Hospital, succumbed to the disease, while in the execution of their duty.

"At Cutch-Mandvi, Nurse Horne died after only a few days' illness, as did also Sister Elizabeth (Fille de la Croix) who nursed at the Government Hospital at Mahim. Two hospital assistants—one at the Jamsetjee Bunder and one at the Mahim Hospital—caught the disease; the former died and the latter recovered. Three military ward orderlies are recorded as having died of the disease contracted while engaged on hospital work.

"It will be observed that the above number of casualties represent a very small proportion of the percentage of the total number of employés, and in that light the result of the precautions taken to prevent infection amongst the staff must be regarded as satisfactory."

Parel Hospital, Bombay.

Surgeon-Captain Thomson recorded the following observations:—

"That the disease is not infectious in hospitals is a well-established fact from experience in the Parel Hospital. In upwards of 240 instances the friends of the patients attended their sick, and in 20 instances scarcely ever left the bedside, and in not a single instance did the disease spread to the friends. Out of more than 140 attendants on the sick belonging to the hospital staff, from time to time, only one sweeper was attacked; and he had been constantly helping in the *post-mortem* room and had a very mild attack with small axilliary bubo. Temperature 100° F. at highest. He resumed his duties on the fifth day afterwards. In three cases amongst hospital orderlies other and special sources of contagion existed, very likely to lead to direct inoculation, and are therefore not considered instances of spread of the disease from mere attendence on the sick. One nurse belonging to another hospital, whose case is given in detail, was admitted.

"The conclusion drawn is that one of the safest places during an epidemic is the ward of a sanitary plague hospital, something more than mere exposure to contagion being necessary to develop the disease—most probably overcrowding, destitution, deficient cubic space, ventilation, and sunlight, and a filthy and general insanitary condition of person, clothing, habitation, and its surroundings.

"Further specific proof of the non-contagiousness of plague in hospital was furnished by one instance in which a mother ill with the disease suckled her infant and it escaped; by one instance in which an infant with plague was nourished on the mother's milk and she was not attacked; and by one instance in which a brother slept in the same bed with his stricken brother and did not contract the disease from him."

Grant Road Hospital, Bombay.

The following extract is from Dr. McCabe Dallas' report:—

"Those most closely associated with the disease, as the working staff, from the medical officers down to the coolies, considering their numbers, enjoyed comparative immunity from infection. Of about 400 people—men, women, and children—who either visited their sick friends or remained constantly by their bedsides, together with the cases under observation, in not a single instance did any of these persons contract the plague. But one of the ward-orderlies doing duty in the hospital became affected through direct contagion in consequence of drinking the remnants of stimulants left in feeding-cups by patients who did not consume the whole contents, and most probably after some cup had been in contact with the mouth of a plague pneumonic case."

Hospitals in Sind.

In the report on plague in Sind Mr. Wingate remarked as follows:—

"At Sukkur, as elsewhere, the sick were accommodated in some of the best buildings in the town, the schools having been placed freely at disposal by the educational inspector, and the best comforts and nourishment that could be procured were provided, while the nursing was that of the motherly Sisters of the Lady Aitchison Hospital, Lahore, generously spared and eager for the service, assisted by the Zenana Mission ladies.

* * * * * *

"While the sick were thus accommodated, usually in the centre of the towns, instead of being banished to some dreaded lazaretto, it was remarkable that the plague hospital attendants and guards, and even the relatives of the sick, enjoyed almost complete immunity. One of these nurses, Miss Horne, in Karachi, besides Sister Isabel at Rohri, took the disease, but she also recovered. Under proper management, the disease seemed paralysed and innocuous."

Experience of previous epidemics.

The experience of previous epidemics was similar to that described above.

Hong-kong.

Staff Surgeon Wilm, in describing the Hong-kong plague of 1896, lays stress on the immunity enjoyed by the persons, and especially by the Europeans, occupied in cleaning and disinfecting houses, in transporting dead bodies and plague patients and in attending on the sick. He argues from these facts that contact with patients suffering from plague and with the bodies of those who have died of the disease, was not dangerous, provided that care was taken to avoid being soiled by the evacuations of the patient, and also to thoroughly disinfect the hands. He draws the further conclusion that the plague infection is not contained in the air and is not therefore taken into the system by the lungs, for had this mode of infection been possible, many engaged in disinfecting houses and treating the sick would have died. It has been seen that this latter deduction is not entirely correct. There can be no doubt that infection is taken through the lungs in the case of persons living in ill-ventilated dwellings.

Dr. Cantlie lays special stress on the fact that the immunity enjoyed by the European doctors and nurses at Hong-kong was shared by the Chinese students of the College of Medicine, who were in constant contact with the sick.

Pali outbreak (Rajputana) in 1836.

Dr. Rennie in his report on the Pali plague of 1836 made the following interesting remarks :— "I feel no hesitation in professing my belief that a man in sound health, provided he continue to breathe pure air, might safely keep his hand a whole day in contact with one suffering under the Pali or Moradabad fever, but if he sat within the same hut and inhaled the same tainted atmosphere half the time, he would probably be seized with similar illness. None of the medical officers or their native assistants, who handled patients affected with the Pali disease and felt their pulses for days and weeks, have suffered."

Observations recorded by Cabiadis during the outbreak at Hillah and Bagdad in 1876-77.

Hirsch quotes a series of observations of similar purport to those mentioned above recorded by Cabiadis on the mode of diffusion of plague in the outbreak at Hillah and Bagdad which occurred in 1876-77. "Persons occupying the same dwelling with a plague patient, and avoiding all contact with him or his belongings for fear of infection, usually take the disease, whereas very few cases of sickness occur among those living in houses free from the plague, although they visit the sick and come boldly into contact with them, remaining however only a short time in the sick-room. All the physicians, surgeons, and assistants who paid visits every day to many hundreds of the plague-stricken in that epidemic remained well, with the exception of one assistant, although the Surgeons and the assistants, who opened

abscesses and dressed and bound up wounds were obliged to spend much time—more than the physicians—in the immediate proximity of the sick or in the closest contact with them."

Health Camps.

Lastly, the experience gained in the health and segregation camps and especially those at Poona, in Sind and at Khandraoni shows that the disease can be at once checked by removing the inhabitants of an infected locality to a carefully supervised camp in the open, especially if their clothes are disinfected at the time of their exodus. With the infected locality the disease is left behind, and if the place is thoroughly cleansed and disinfected the infection will be found to have vanished when the inmates return to their dwellings. Full details on this subject will be given in later chapters.

Plague commonly spread from place to place by persons infected with the disease.

Practically the common way in which the pestilence is spread from place to place is by persons infected with the disease and their personal effects. Persons in whom the seeds of the malady already exist move from one place to another, and the disease may not perhaps develop in them until they have arrived at their destination. Here, if they are not watched, and if local insanitary conditions and uncleanly habits favour the spread of the disease, they infect their immediate attendants and friends from whom the disease spreads in widening circles. The following remarks recorded by Dr. Rennie with regard to the Pali plague afford an interesting illustration :—

Infection carried by fugitives during the Pali plague.

"Most of those who escaped the malady evinced from an early period their conviction of its infectious character by deserting the town (Pali) and seeking refuge in the neighbouring villages. The neighbours of these fugitives entertaining similar dread of infection, often refused them shelter. Yet many of the persons who left Pali in this manner finally got admission into the houses of their friends, and wherever they took up their residence the fever shortly afterwards appeared."

Typical instance at Khandraoni in Gwalior during the Bombay epidemic.

The history of the epidemic in the Bombay Presidency affords further abundant illustration of the manner in which the malady was spread by individuals. The outbreak in the village of Khandraoni affords perhaps the most typical and well-defined instance that occurred of the diffusion of the disease in this manner. Khandraoni is a small village situated in the Gwalior State and distant about twenty miles from Jhansi. The population, in July 1896, was 558. For some years past several of the inhabitants of Khandraoni had been in the habit of going to Bombay and taking service there, revisiting their village at intervals ; among these were two Brahmins, Bindraban and Khoobi, the former being one of the headmen of

the village. These two Brahmins came from Bombay to Khandraoni in January 1897, at a time when the epidemic was virulent in Bombay. They travelled straight from one place to the other and arrived at Khandraoni on the 9th of the month. On leaving Bombay Bindraban was suffering from fever and Khoobi attended him on the way, bringing him to Jhansi by rail and from there, in a country cart, to Khandraoni, where he died five days after his arrival. Two days after Bindraban's death, Khoobi fell ill and died in three days, and almost a week after his death a native doctor of the village who attended the two Brahmins was attacked with fever and died, and at the same time a second native doctor, who came from another place to treat the first doctor, also succumbed to the disease. The plague then gradually spread amongst the inhabitants of the village, and by the 18th March, 59 seizures had occurred, of which 47 had proved fatal.

**Infection spread by animals.**

Having investigated the manner of the spread of infection by persons suffering from plague and their surroundings, the next point for consideration is the danger of infection from animals. It will have been gathered from the account of plague in animals that the

**Rats.**

principal danger is to be apprehended from rats. Authorities differ somewhat as to the extent of this danger, but it is certainly not so common a cause of infection as the sick person and his surroundings. Staff Surgeon Wilm in his note on the Hong-kong plague states that infection can be carried by animals, especially rats and mice. It has been stated above that the German Commission formed the conclusion that by means of rats plague germs can be introduced from one house to another and conveyed to man. General Gatacre stated that "amongst other sources of the spread of disease throughout the epidemic, the influence of rats has been shown in many extraordinary ways. Grain depôts are often the first centres in the spread of the plague, the infection having been imported into the colony of rats that haunt the depôts, spreads amongst them, and they die in large numbers. In this way the grain and grainbags are infected and become sources of conveyance of the disease to human beings. The Committee (*i.e., the Bombay Plague Committee*) have, during disinfection, invariably treated these places where rats have been known to die as plague infected localities." This no doubt was a wise and necessary precaution, but it is open to doubt whether General Gatacre does not attach too great an importance to the part played by rats. Mr. Snow, the Municipal Commissioner of the City of Bombay and Dr. McCabe Dallas also lay great stress on the danger of the spread of infection by rats. On the other hand, Dr. Bitter considers that rats are of very minor importance as agents in the dissemination of the disease, and Dr.

Rogers, another Member of the Egyptian Commission, holds the same view.

Monkeys, pigs and domestic animals.

Recent experience at Kankhal would seem to show that there is a possibility of plague being spread by monkeys, and experience in Hong-kong points to the possibility of infection being carried by pigs. Apart from these animals there does not appear to be reason to apprehend that danger exists of plague being spread by animals. The remarks made in a previous section of this chapter on the non-susceptibility to plague of the domestic animals are of great importance in this connection.

Food-stuffs.

Next, with regard to food-stuffs. It is generally admitted that the infection of plague may be caught through the medium of infected food, the infection being received through the tonsils or the alimentary canal. But both laboratory experiments and general experience tend to show that this danger is much less than the danger arising from the sick and their surroundings. In the first place, food-stuffs are not very likely to be contaminated by the dejecta or morbid products of plague patients (excepting the infection of grain by rats), in the second place, experiments tend to show that food-stuffs do not form a medium favourable to the life of the plague bacillus, and in the third place, grain is usually cooked before being eaten. Again, the special forms of the disease which can most reasonably be attributed to infection by food are rare. Lastly, there is no evidence to show that during the present epidemic the plague was in any case spread from one place to another by infected grain or other food-stuffs. During the epidemic in Sind considerable quantities of grain were imported from the infected area into other localities without in any case spreading infection. At the same time it must be stated that careful precautions were taken to prevent the export of any grain likely to be infected. That some danger does exist cannot be denied, and the precautions adopted in Sind were necessary and fully justified. This matter is further discussed in Chapter XII.

General articles of commerce.

The degree of danger to be attributed to the spread of infection by general articles of commerce is naturally a matter of the first interest and has been keenly discussed. Formerly very great importance was attached to this method of diffusion, and in consequence stringent regulations were imposed by healthy against infected countries. Hirsch makes the following remarks on the subject :—

Remarks made by Hirsch.

"There can be no doubt of the diffusion of the morbid poison by goods; and this is another of the points on which there is incontrovertible evidence from the sixteenth and seventeenth centuries. Proofs

are also given by Kanold from the epidemic of 1709-10 in Prussia, by Autrichan from the plague of 1720 in Toulon, by Desgeuettes, Puguet, and other French Army Surgeons, from the epidemics of 1798 and 1799 in Egypt and Syria, by Bulard from the epidemic of 1834-35 in Egypt, and by Ségur-Dupeyron from observations made in the quarantine stations of Venice (1793 and 1818); and Syria (1832, 1834, 1837); and the last mentioned are so convincing that even the Paris Academy of Medicine, which maintained a very sceptical attitude towards the doctrine of the communicability of plague, could not but admit their importance."

**Modern research shows that the danger is not great.**

Modern research, however, tends to show that the danger is more restricted and less important than was formerly held to be the case. As in the case of food-stuffs, there are not many ordinary articles of commerce which are likely to be contaminated by the dejecta or morbid products derived from the sick, and it would appear that ordinary commercial articles do not form media favourable to the life of the bacillus. It has been said that clothing and bedding and other such articles contaminated by the sick and kept in a moist condition away from the disinfecting action of the atmosphere can probably retain the power of infection for a considerable period. Such articles, whether carried as merchandise or as the baggage of travellers, are rightly regarded everywhere with great suspicion. For similar reasons rags from an infected locality must always be regarded as dangerous. But it seems doubtful whether the danger goes much beyond this. Dr. Bitter has recorded the following important remarks on this subject:—

**Remarks by Dr. Bitter.**

"Les marchandises du grand commerce, telles que coton, blé, tissus neufs, cuirs, provenant d'un pays infecté de la peste, n'offrent qu'un danger tout à fait secondaire. D'un côté, elles ont relativement très peu de chances d'être contaminées, et de l'autre côté, par leur nature, elles ne sont pas bien aptes à conserver longtemps vivant le bacille, et le mode de leur emploi ne les met pas souvent dans ce contact intime avec l'homme qui semble nécessaire pour l'infection. Nous nous trouvons du reste, ici, vis-à-vis d'un fait qui s'observe également pour d'autres maladies épidémiques, tel que le choléra. Nous n'avons pas d'exemple qu'une telle épidémie ait été importée dans un pays par des marchandises de commerce proprement dites.

"Le seul article du gros commerce qui mérite une attention sérieuse, ce sont les chiffons, qui offrent le même danger que les vêtements, linges, tapis, etc. Il ne peut y avoir de doute que parmi les chiffons ramassés dans une ville ou un pays où règne la peste, il n'y en ait une quantité considérable qui soit contaminée."

The following is a list of the articles of merchandise classed as susceptible by the Venice Sanitary Convention of 1897 :— Articles classed as susceptible in the Venice Sanitary Convention of 1897.

1. Used linen, clothing, personal effects and bedding.
2. Rags, not excepting rags compressed by hydraulic force which are carried as merchandise in bales.
3. Old sacking, carpets and old embroidery.
4. Raw hides, untanned and fresh skins.
5. Animal refuse, claws, hoofs, horsehair, hair of animals generally, raw silk and wool.
6. Human hair.

The articles named in the first three numbers in this list were included in it as likely to have been in contact with sick persons.

The more important articles named in the fourth and fifth numbers were included in the list for fear they might be derived from animals that had suffered from plague. Recent investigation on the degree of susceptibility of different classes of animals to plague shows that this precaution may be unnecessary.

There is no evidence to show that a single case of plague has been occasioned by merchandise imported from the infected portions of India, although large quantities of wool and other commodities have been exported from Bombay to England and other countries since the beginning of the epidemic.

Other possible sources of infection must be regarded as of minor importance to those already described. It may be taken as proved that the microbe does not travel about for considerable distances in the air or in dust, etc., and that healthy persons cannot carry the seeds of contagion with them except in the form of clothes, rags, etc., impregnated with infectious matter. The water-supply is said to be a possible source of danger, and no doubt should be the subject of careful precaution. Staff Surgeon Wilm lays stress upon this possible source of infection. General Gatacre gives an instance in which a stagnant pool of filthy water is believed to have fostered the spread of infection in a village in the Island of Bombay (see Chapter VII). But it has been seen that under ordinary conditions the bacillus appears to die rapidly in water. The drains are also regarded by some persons as a probable means of spreading infection, although, according to Dr. Bitter, it is not likely that the bacillus can exist for long in sewers. At the same time a careful attention to drainage is a precaution which should certainly be adopted, and constant flushing of sewers with a solution of corrosive sublimate is said to have had a beneficial effect in the Mandvi quarter of Bombay. Both Dr. Bitter and Mr. Hankin are inclined to think that graveyards containing plague corpses are not Other possible sources of infection.

likely to be a source of danger, but the knowledge on this point is not sufficiently certain to make careful precaution with respect to graveyards in crowded portions of cities unnecessary.

## Influence of Climate and other Natural Conditions.

**Moderate warmth and dampness favour the development of plague. Experience of former epidemics.**

Moderate warmth in conjunction with dampness seem to be the most favourable conditions for the development of plague. In the cooler parts of the East and formerly in Europe, the epidemics occurred mostly in summer. In middle Egypt, particularly in Cairo, the epidemic used to cease in the height of summer at the time of the excessive dry heat: an epidemic never commenced at that time of the year. In Mesopotamia it appears mostly in the temperate season, and becomes dormant during the hot weather. By severe cold the spread of the disease seems to be restricted, but nevertheless epidemics have occurred during the severe cold of winter (at Moscow in 1771, at Astrakhan in 1878-79), as well as during great summer heat.—(Scheube.)

**Hong-kong.**

Staff Surgeon Wilm recorded the following observations on climatic influence over the course of the Hong-kong plague:—

"Both in 1894 and in 1896 the epidemic broke out at the end of the cool season, which was damp though free from rain. It began in May in 1894, in April in 1896. In the latter year isolated cases came under observation from January to March, and these occurred chiefly in the western part of the town inhabited by the Chinese. In both years the epidemic reached its height in the early months of the hot season in May and June, and then suddenly subsided. From these facts the only conclusion to be drawn is that the plague in Hong-kong thrives better in a damp, moderately cool tropical climate than in a hot one. But in this connexion we must not forget that in the cool season the houses of the Chinese are much more overcrowded than in the hot season."

**Climatic influence on the course of the epidemic in the Bombay Presidency and Sind.**

The course of the epidemic in the Bombay Presidency points to the conclusion that the dry heat of an Indian summer is less favourable to the development of the disease than the climate of the cooler and damper months. In the city of Bombay the existence of the disease was discovered during the warm damp weather that followed the abnormally early close of the autumn rains. The epidemic reached its height in the cool season—in the month of February—and then steadily declined, until towards the end of June only

occasional cases occurred. In Thana district the epidemic began in December, in Poona city early in January, and in Surat and Kolaba districts early in February. In Thana and Poona the epidemic culminated about the end of March, in Surat in the beginning of April, and in Kolaba about the end of April. In all these localities it had almost disappeared by the middle of June. In Sind, where the infection was probably brought from Bombay, the outbreak occurred later than in the Bombay Presidency proper and was also shorter lived. In Karachi the epidemic broke out in the second-half of December and attained its greatest virulence early in February. Throughout February and March the epidemic continued to be very severe; the number of cases then quickly fell. In Hyderabad city the disease began early in March and was at its worst in the first-half of April; with the end of May the epidemic practically died out. The epidemic in Sukkur began in February, culminated early in April and was over by the end of May. The last place in which a serious outbreak occurred during the first period of epidemic was Mandvi in the Cutch State. The outbreak began in April and became virulent in May. Towards the end of May it declined in violence and throughout June the fall in the number of cases continued; in July they numbered on an average about one a day, and in August the epidemic disappeared, having, however, in the meantime spread to other places in the neighbourhood. First period the epidemic.

The recrudescence in the districts of the Presidency proper, which afterwards attained such serious dimensions, began about the middle of July in Baroda territory and in the districts of Poona, Satara, and Surat. In the early part of the cold weather it rapidly spread and increased in violence. The recrudescence.

Broadly in 1896 the epidemic began at the end of the rainy season, increased in virulence until the middle or end of the cold weather and rapidly declined during the hot weather months. In the present year the recrudescence began in the latter part of the rainy season and spread in the cold season. General remarks.

The crowding of the people into their homes during the cold season must exert an unfavourable influence apart from the mere climatic change. Overcrowding in the cold season.

The description of the climate of the Bombay Presidency and Sind which is given in Chapter V illustrates the very different climatic conditions under which the plague can exist. It was equally fatal in Sind with its arid climate and extreme variations of heat and cold, in the moist and equable Konkan which receives the full force of the Varied climatic conditions in which plague can exist.

monsoon torrents, and in the comparatively dry uplands of the Deccan. But in all these places the hottest part of the year succeeded, completely or for the time, in subjugating the epidemic.

**Statement and chart.**

A comparison of the course of the plague in different localities with the variations in temperature during the epidemic is given in a statement in Appendix III, and illustrates the above remarks. The chart in Volume IV, page 26, affords a further illustration.

**Altitude and geological characteristics have no influence on plague.**

Scheube states that neither the geological character of the ground nor its altitude has any effect on the initiation of the disease. It is unnecessary to elaborate this remark. The history and geographical account of plague given in subsequent chapters will make its truth at once evident.

## Origin and Course of Plague Epidemics.

**Origin of plague epidemics.**

It was formerly a subject of frequent contention whether plague can have an autochthonous origin or whether an epidemic must in all cases be started by previously existing germs of the disease. Modern bacteriological research, in demonstrating that plague is due to a specific bacillus, has thrown much light on this vexed question, but it has not been settled beyond doubt whether the pathogenic cell may be derived from an innocent one.

**General course of plague epidemics.**

Scheube makes the following interesting remarks on the general course of plague epidemics:—

"If plague is imported anywhere, for the first three or four weeks isolated cases occur in the neighbourhood of the imported case, and subsequently dissemination of the contagion and a general spread of the disease take place. An epidemic will at times last only a few weeks or months, but may extend over several years. The abatement generally comes rapidly, but sporadic cases will still occur at times for years, and the epidemic may break out again without a renewed importation from outside."

**Gradual growth.**

These remarks are entirely in accord with the experience of previous and the present epidemics. The gradual manner in which plague epidemics grow is a natural sequence of the fact that the infection is not carried about in the air, but is in general disseminated amongst the immediate surroundings of the sick, its virulence gradually increasing in the fostering element of insanitary surroundings. The phenomenon has been markedly characteristic of the present epidemic in almost all places in which it has raged. This point will be made

clear in subsequent chapters. It is practically of great importance in the facility which it affords to stamping out an epidemic at the outset.

Duration.

The long period over which plague epidemics have lasted is a well known feature of the history of plague in Europe. In India also, at the beginning of the present century, there was a plague epidemic in Gujarat which lasted ten years.

Recurrence in endemic centres.

The plague centre on the northern slopes of the Himalayas affords an Indian example of the manner in which plague epidemics may occur in a place where the disease is endemic at considerable intervals of time without the introduction of fresh infection from outside. Mild sporadic cases are the main link between successive epidemics. The extent to which the disease may be kept alive for a considerable period in surroundings favourable to the vitality of the bacillus is, it has been seen, a matter about which a final opinion has not yet been expressed.

## Curative Treatment.

Paper by Dr. Cantlie.

It is not within the scope of this report to give details of the medical treatment in cases of plague. A paper by Dr. Cantlie on the treatment of plague, which was circulated to Local Governments, is given in Appendix I.

Small effect of medical treatment.

Influence of good nursing and healthy surroundings.

Parel Hospital, Bombay.

The medical treatment is limited to the treatment of symptoms and has proved of little effect in arresting the fatal course of the disease. Experience has, however, shown that good nursing and healthy surroundings are of material assistance. Surgeon-Captain Thomson, Parel Hospital, Bombay, remarked as follows: "In the treatment of plague, symptoms can be relieved and the chances of favourable termination promoted; but little can be done to shorten its course and ensure recovery . . . . The success of any treatment depends on early and good nursing, and keeping the patients lying down until the temperature has been normal for at least four days . . . . Abundance of fresh air is of next importance, and in Parel each patient had nearly 2,000 cubic feet of air space and free perflation of air."

Grant Road Hospital, Bombay.

The following extract is from Dr. McCabe Dallas' report on the Grant Road Hospital, Bombay:—

"As regards the effect of medicine, it cannot be stated with satisfaction that we possess any standard remedies of certainty. What might seemingly cure one patient is ineffective in another of the same type, and it is questionable, whether the successes shown are not wholly due to scientific nursing and hygienic surroundings of a

superior nature and to personal comfort and healthy ventilation. This, of course, was impossible during the "opposition period" of the epidemic, when a large percentage of patients were permitted to remain where they fell ill, in low, dark, overcrowded, ill-ventilated rooms, without proper food, or probably no food at all, and absolutely unsupported by the administration of alcoholic stimulants."

An important subject on which it is necessary to make a few remarks is the endeavour that was made to utilise bacteriological knowledge by attempting to cure patients by the injection of a therapeutic serum.

**M. Yersin's curative serum. Inconclusive results.**

During the Hong-kong epidemic M. Yersin experimented on the effect of the subcutaneous injection of a curative serum derived from horses immunized by injection of prepared cultivations of the bacillus. A description of this method is given in a paper* by MM. Yersin, Calmette and Borrel. On the outbreak of plague in Bombay M. Yersin visited the city and pursued experiments with serum supplied by the Pasteur Institute of Nha Trang. The result of the experiments was inconclusive and medical opinion in Bombay was unfavourable to the treatment. The serum had to be hastily prepared and was weaker than that used in China in 1896.

**Inconclusive result of experiments by M. Haffkine.**

M. Haffkine also endeavoured to cure patients by the injection of therapeutic serum. At the time of the outbreak of plague he was engaged in investigations connected with anti-cholera inoculation. He was at once deputed to Bombay under the orders of the Government of India, and was employed there throughout the epidemic. In a letter of the 14th† July he described the result of his experiments. A number of animals having been brought to a high degree of immunity, the effect of serum derived from them was tried on patients in whom the severity of the disease did not leave hope of its yielding to the ordinary treatment. No clear results could be obtained as to the effect of the drug. M. Haffkine then resolved to prepare a large amount of serum, to be tested in the manner adopted in the case of the serum for diphtheria, namely, by its application to a very large number of cases, severe and mild, and by comparing the mortality among these cases with the mortality amongst a similar group of patients not treated. For there remained the possibility of the therapeutic serum, without producing a clear effect in every case influencing to an appreciable extent the general mortality. No decisive results have been reported.

There is, however, distinguished authority in favour of the system of injecting a curative serum, and it is possible that better results may be obtained on a future occasion.

* Annales de l'Institut Pasteur, 1895, pages 589—592. | † Appendix I.

The following remarks on the subject occur in General Gatacre's report :— Remarks by General Gatacre.

"Despite the apparent failure of the treatment to have an appreciably beneficial effect on the disease, the Committee (*i.e.*, *the Bombay Plague Committee*) wish to draw attention to the fact that it is based on sound laws of scientific experiment and research, that these have not yet reached the full perfection which it is reasonable to expect, that the serum first used by Dr. Yersin was of feeble immunizing power, and that the subsequent operations of Dr. Yersin at Cutch-Mandvi with anti-toxin serum of a higher standard than that which he used in the first instance in Bombay, were attended with more commendable results."

The opinion of the German Commission was as follows :— Remarks by the German Plague Commission.

"The experiments* as to cure made with strong serum showed it undoubtedly possesses curative properties, though of course this can only be held to apply to the animals on which the experiments were made. Whether a similar curative action can be attained in the case of man must not, as the observations on the similarly sensitive grey monkeys show, be rashly concluded, but must be found out by observations in men sick of the plague. In such cases it seems that up to the present only the older weaker sorts of serum have been used."

The Russian Commission also experimented on monkeys and stated the following conclusion :— Experiments of the Russian Commission on monkeys.

"Nos expériences dans cette direction et pour lesquelles nous avons employé 90 *singes* nous ont démontré que :

1°. Le sérum de Yersin peut guérir les singes malades lorsque le traitement a été commencé presque deux jours après l'infection sous-cutanée, et lorsque les symptômes de la peste sont déjà très manifestes, élévation de température, bubons, etc ;

2°. Le traitement par le sérum n'est plus efficace lorsqu'il est commencé trop tard, c'est-à-dire 24 heures avant la mort des singes qui servent de contrôle ;

3°. La quantité indispensable de sérum pour obtenir le guérison des singes n'est pas très grande ; en moyenne, il suffit d'injecter 20 c. c. de sérum actif au $\frac{1}{10}$ ;

4°. Si la quantité de sérum injectée est trop faible, ou si le traitement est entrepris trop tard, on peut parfois obtenir la guérison, mais quelquefois cette guérison n'est qu'apparente : il peut se produire une rechute, qui cause la mort des animaux après 15 ou 17 jours."

* Made on monkeys.

**Favourable comments by the Russian Commission on the Yersin treatment.**

The members of the Russian Committee commented favourably on the Yersin treatment :—

" En ce qui concerne le traitement des malades par le sérum de Yersin, nous devons dire que dans plusieurs cas nous avons été a même d'observer les effets intéressants et frappants de l'action de ce sérum. Après l'injection la température s'abaisse, la somnolence ou le délire disparaissent, le malade retrouve le bienêtre. En général, les résultats n'ont pas été aussi bons que nous l'aurions désiré ; ils ont cependant réduit la mortalité a 40 % sur les malades traités.

" Nos expériences nous ont pourtant montré que le sérum a une efficacité qui n'est pas douteuse. Cette mortalité encore elevée s'explique pas des causes suivantes :

" D'abord les malades n'entrent que très tard dans les hôpitaux trois, quatre ou cinq jours après que la maladie est déclarée.

" Ensuite, nous ignorons quelle sera la durée de la maladie qui n'a pas la même intensité dans chaque cas. Des malades meurent en 24 heures, d'autres survivent pendant 24 jours.

" La troisième cause est que les hommes montrent des degres très variés de sensibilité à l'infection. Celle-ci est plus uniforme chez les singes.

" Dans les cas de pneumonie pesteuse, c'est souvent la présence d'autres bactéries, *pneumocoques* et *streptocoques*, qui explique la difficulté d'obtenir la guérison par le sérum.

" Nous espérons obtenir de meilleurs résultats avec le sérum antitoxique que le Dr. Roux vient de préparer, celui qui a été employé jusqu' ici est plus préventif qu'antitoxique.

" Quand même un remède n'aurait sauvé que quelques vies, cela serait suffisant pour le faire remarquer et encourager à l'étudier.

" En réalité, le sérum de Yersin a sauvé un grand nombre d'existences et nous devons très chaleureusement recommender cette méthode de traitement. Le sérum reste d'ailleurs jusqu'ici l'unique remède à employer dans le traitement de la peste."

**Unfavourable comments by Dr. Bitter.**

Doctor Bitter's opinion is unfavourable :—

" Mais aussi le traitement spécifique par l'injection du *sérum antipesteux* de Yersin n'a pas, d'après ma connaissance, donné des résultats concluants. Au point de vue théorique il y aurait, à mon avis, à faire les remarques suivantes, qui nous démontrent que les statistiques, quant à l'efficacité du sérum, doivent être recueillies avec beaucoup de soin. D'abord environ 50 % de tous les cas de peste (sauf les cas pneumoniques) se guérissent par voie naturelle. Ils n'ont donc pas besoin d'une injection de sérum. Pour les cas qui ont la tendance de finir par septicémie, je crois que l'injection du

sérum doit avoir lieu dès le début de la maladie, alors que les bacilles sont encore confinés dans le bubon primaire, si l'on veut avoir une chance d'empêcher leur entrée dans le sang. Une fois la septicémie établie, a mon avis on n'aurait qu'une chance infinie d'arrêter l'issue fatale même en employant un sérum tres fort."

If Dr. Bitter's view is correct, M. Haffkine's experiments on patients so far advanced in the disease that their recovery under ordinary circumstances was hopeless could not have had a successful issue.

## Preventive Inoculation.

More hopeful results of preventive inoculation.

A more extensive trial was given to the system of preventive inoculation worked out by M. Haffkine, and on the whole with more hopeful results.

M. Haffkine's description of the principle.

In a report,* dated the 16th January 1897, he described the principle on which the inoculation system is based in the following terms:—

"In the course of the present researches I have found different media which give rich cultures of the plague bacillus, permitting to cultivate them in abundant and concentrated quantities.

"The virulence of these cultures is shown by the fact that 1 or 2 minims are sufficient to communicate certain death to the larger rodents.

"The destruction of the bacilli in the culture by delicate processes, such as the addition of essence of mustard, of very weak solutions of carbolic acid, or by dessication, or by heat, deprives these cultures of their fatal properties and makes a dose forty to fifty times bigger than the fatal one, quite harmless to the animals.

"But while depriving the cultures of their noxious properties, the above processes leave to them the powers of protecting the system against fatal infection.

"Rodents which have had an injection of such cultures (with microbes killed in them), when infected five days after the prophylactic treatment, stand easily a dose which would be fatal to *ten* other not protected animals."

M. Haffkine's inoculation of himself.

Having established these facts, M. Haffkine caused himself to be inoculated on the 10th January in order to observe the symptoms of the operation in man. He suffered pain at the seat of inoculation, a rise of temperature (maximum 102°F.), slight headache and a feeling of faintness. The temperature became normal after 24 hours.

* Appendix I, Paper No. 12.

**Persons inoculated up to the end of May.**

Subsequently many persons were inoculated both by M. Haffkine and by medical officers who were instructed by him. On the 31st of May the Government of Bombay reported that 7,874 persons had been inoculated in Bombay, and 4,352 in other places. The process is still being continued and is being more widely adopted.

**Experiments in the Byculla Jail, Bombay.**

On the 17th February 1897, M. Haffkine submitted a report* on experiments made with the prophylactic serum during an outbreak of plague in the Byculla Jail at Bombay. Between the 23rd and 29th January nine cases of plague occurred in the jail, of which five proved fatal. The population of the jail at the beginning of the outbreak numbered 345. The prophylactic treatment was applied on the 30th January, 154 out of a total of 337 volunteering to be inoculated. The following is the result recorded by M. Haffkine. In an average daily strength of 173 non-inoculated persons 12 cases occurred, of which 6 proved fatal. In an average daily strength of 148 inoculated persons 2 cases occurred, neither of which was fatal.

**General result of 7,905 inoculations.**

In a report,* dated the 14th July 1897, M. Haffkine summarises the general results of the experiments with the prophylactic serum (excluding the Byculla Jail experiment) as follows:—

"Amongst the 7,905 persons inoculated in Bombay during the epidemic, and who all came from the most threatened localities and homes, there were * * * :—

(*a*) *two* persons who were already unwell at the time of inoculation, and who developed unmistakeable plague within the next twelve hours; they eventually succumbed;

(*b*) and *sixteen* persons, who were attacked more than twelve hours after inoculation, and all recovered."

M. Haffkine remarks that he is specially confident with regard to the number of fatal cases reported, whereas in the number of cases which ended in recovery there may have been neglect in reporting, as a large proportion of the cases were exceedingly mild. Any increase in the number of cases ending in recovery would, M. Haffkine observes, put in a still more satisfactory light the small mortality among persons attacked by plague after inoculation.

**Circumstances militating against the force of the conclusions.**

Circumstances militating against the force of the conclusions to be derived from these experiments are that the subsequent history of the persons inoculated is not fully known, and that the inoculation was to a large extent performed when the plague was on the wane and on classes of persons not the most likely to contract plague.

* Appendix I.

The result nevertheless may be regarded as hopeful. The experiments were followed by several of the medical officers employed on plague duty in Bombay, and their opinion is distinctly favourable to the system.

Later report on experiments at Daman.

The objections alluded to above are of less weight in the case of the extensive and satisfactory experiments made during the virulent plague epidemic at Lower Daman, with regard to which M. Haffkine and Surgeon-Major Lyons made a joint report in November 1897. The investigation into the results of the inoculation was very carefully carried out, and the circumstances were specially favourable to a complete examination owing to the existence of unusual facilities for ascertaining the subsequent history of the persons inoculated. A careful contrast was also made between the mortality among persons who were and who were not inoculated, living under similar conditions and therefore equally liable to infection. The period of observation extended from the 26th March to the end of May and the observations were made with respect to the whole of the inhabitants of the infected part of the place. At intervals 2,197 persons were inoculated and it is estimated that there were 6,033 persons in the place who remained uninoculated. Rather more than a quarter of the inhabitants were thus inoculated. Among the 6,033 uninoculated there were 1,482 deaths, giving a mortality of 24·6 per cent., while among the 2,197 inoculated there were 36 deaths, giving a mortality of 1·6 per cent. According to these figures the reduction in the rate of mortality was 89·2 per cent. M. Haffkine considers that the result might have been better had not the serum used in some of the experiments been too weak. The report contains the following interesting summary of the results of inoculating a portion of the members of homogeneous groups of persons living under similar conditions:—

General results.

Inoculation in homogeneous groups of persons.

"In a large number of households the whole of the members of the family were inoculated, leaving none for comparison as regards susceptibility to the disease. This circumstance rendered it necessary to compare the whole inoculated population with the whole of the uninoculated population, as has been done above. However, in 62 of the inoculated families in which cases occurred, there were 124 persons who remained uninoculated, while the number of inoculated in these families was 250. A comparison between this fraction of the inoculated population with their uninoculated relatives shows the following results:—

124 uninoculated had 54 cases (43·5 per cent.) with 37 deaths (29·8 per cent., case mortality 68·5 per cent.),

250 inoculated had 50 cases (20 per cent.), with 20 deaths (8 per cent., case mortality 40 per cent.).

"The inoculated households lived, therefore, under no specially immune conditions, as the mortality among their uninoculated members, 29·8 per cent., was 5·2 per cent. higher than the mortality in the general uninoculated population. This must invariably be the case, as only people from badly-affected or particularly-threatened localities present themselves for inoculation. It will be noticed also that this small number of 124 uninoculated had a mortality higher by 1 death than the total mortality sustained by the 2,197 inoculated inhabitants of Daman; and that a comparison between the inoculated and uninoculated members of these families shows that if the 250 inoculated had exhibited the same susceptibility as their 124 uninoculated relatives, they should have had 75 deaths instead of 20—a difference of 73·3 per cent."

"A similar conclusion is arrived at on comparing the mortality in the Parsee community . . . . which shows that the inoculated members gave a reduction of 97·4 per cent. of deaths when compared with the uninoculated of the same community."

**Inoculation in Poona.**

In Mr. Rand's report on plague in Poona, where 1,249 persons were inoculated up to the beginning of May, it is stated that "the officers in charge of the various plague hospitals were instructed to note whether any cases of plague occurred among persons who had been inoculated. No such cases have been reported, which is evidence in favour of the efficacy of Professor Haffkine's lymph. It has to be remembered, however, that the inoculations were not commenced till after the epidemic had passed its highest point, that a large proportion of the persons inoculated did not live in a highly infected locality, and that most of them did not belong to the classes that have been the chief sufferers from the plague in Poona."

**Symptoms after inoculation.**

The inoculation frequently results in temporary fever and some physical suffering, but there was only one case where, for a short time, a question arose whether inoculation had caused the death of a person. M. Haffkine reported that a Brahmin got an attack of hemiplegia and died on the eleventh day, but that medical investigation showed that the attack was connected neither with plague nor with the inoculation.

**Experiments made by the German Commission.**

The following are the results of the experiments made by the German Commission in immunising monkeys:—

"For the purpose of artificial immunisation living and fully virulent cultivations can be used only in the case of animals that are but little sensitive. It proved necessary to operate with killed cultivations which possess a more or less high degree of protective power, as proved by the experiments performed, as well as by Haffkine's still

earlier preventive inoculations. This protective power is damaged by all the most powerfully acting agencies, such as boiling heat; and in order to kill the bacteria with certainty without destroying the protective power, the most advantageous process was found to be the treatment of the cultivation for one hour with a temperature of 65°C. The immunity does not appear at once, but after a certain interval (from about the 5th to the 7th day); and it is not so high a degree as that which is attained by infection with living cultivations. Experiments with regard to its duration could not be made, as they would have required many months. From the experiments described, and others which of course in many points require repetition and testing, it can in the meantime be deduced, that, for future immunisation with dead cultivations, cultivations of undiminished virulence, which have been killed in the way described, are to be used. The height of the natural immunity, such as is attained by going through an attack of plague, can in the meantime only be reached by subsequent inoculations with living plague bacilli."

Comments of the German Commission on inoculation in Daman.

The German Commission also investigated the effect of preventive inoculation in Daman, and their conclusions were on the whole favourable:—

"Haffkine's preventive inoculations were carried out in the case of about 1,400 persons in Daman. A protective action of the procedure was undoubtedly recognisable; though the protection was apparently only a limited one, because among the inoculated not a few cases of plague occurred (with, however, remarkably mild course), and, as can be proved, in about 20 cases ended fatally."

Experiments by the Russian Commission on monkeys.

The members of the Russian Commission stated the following conclusions from experiments conducted on monkeys:—

"L'immunité donnée par l'inoculation préventive de 10 c.c. du sérum de Yersin ou de 5 c.c. de la lymphe de Haffkine, ne dure pas au delá de 10 ou 14 jours;

"L'immunité résultant de l'inoculation préventive, faite avec des cultures sur gélose chauffées à 60° centigrades, ne se produit pas avant sept jours, mais cette immunité se prolonge pendant plus longtemps. Un singe inoculé par ce procédé, et infecté 21 jours aprés l'inoculation, ne montra aucun symptôme de peste."

Comments of the Egyptian Commission.

Both Dr. Rogers and Dr. Bitter pronounce conclusions which are on the whole unfavourable to the Haffkine method of treatment. They are summed up in the following passage from Dr. Rogers' report:—

"There is always the danger that the enthusiastic advocate for preventive inoculations, more particularly if he only have a laboratory

and not a medical and sanitary education, should view with indifference if not actually oppose the application of practical sanitary measures, relying on a method for dealing with disease which from the laboratory point of view is perhaps conclusive.

"The individual who dreads contracting the disease, if he believes in preventive inoculation, will probably have recourse to it, but he must not imagine that it is always so simple an operation as it is sometimes described.

"It may be followed by serious and painful symptoms lasting for three or four days.

"The efficacy of preventive inoculations against plague remains yet to be proved.

"The fact that so many thousands of the population of Bombay have been inoculated since the end of January and have not contracted the disease proves nothing. These same people were presumably exposed to infection from August to the end of January, without being inoculated and without contracting the disease, which almost as soon as the inoculations were begun, commenced to be on the wane.

"Nor are the figures of the House of Detention, Bombay, to which so much importance has been attached, in any way conclusive. If even the efficacy of preventive inoculation in individual cases be fully established, its practical application would probably be limited to groups of the population, such as schools, regiments or prisons. The most ardent advocates of the system would hardly pretend that it could replace general sanitary measures, while the protection of an entire community, such as the population of the city of Cairo, would be practically impossible."

# CHAPTER III.

## GENERAL HISTORY AND GEOGRAPHICAL DISTRIBUTION.

* The history of the plague may be followed into remote antiquity, and, with a certain measure of certainty, even as far as the end of the third or beginning of the second century of the pre-Christian era. In one of Oribasius' medical extracts from Rufus of Ephesus, a contemporary of the Emperor Trajan (98—117), the plague boils are described, and allusion made to their occurrence in epidemic form in Lybia, Egypt, and Syria. The first accurate historical record which exists is that of the great pestilence which spread over the Roman Empire in the sixth century, during the reign of the Emperor Justinian. The pandemic is estimated to have lasted from fifty to sixty years, and it wrought frightful devastation wherever it appeared.

The plague in remote antiquity and in classical times.

The Justinian plague.

This outbreak gave the plague a firm hold over Europe, which lasted for more than a thousand years. The history of the pestilence after the Justinian plague is very vague until the episode of the *Black Death*, the great pandemic of the fourteenth century. Contemporary writers place the origin of this outbreak in India or China, whence it is said to have spread over the countries of Asia Minor to the north coast of Africa and Europe. No part of the then known world escaped the ravages of the pestilence; even distant Greenland was depopulated. According to Hecker's estimate, 25 millions of human beings succumbed in Europe, or about a quarter of its population at that time.

Plague in mediæval times. The Black Death.

* This account up to the description of plague in China is mainly derived from the Chapter on Plague in Volume I of Hirsch's Handbook of Geographical and Historical Pathology.

**Plague in the fifteenth to seventeenth centuries.**

Throughout the fifteenth and sixteenth centuries and during the first two-thirds of the seventeenth century the plague continued to appear frequently over wide areas of the continent and islands of Europe. In the last thirty years of the seventeenth century the plague was observed

**Retreat from the west and centre of Europe.**

to be gradually retreating, and only twice after the beginning of the eighteenth century did it become at all widely diffused in the western and central regions of the continent. From the middle of the eighteenth century only the south-eastern parts were a permanent seat of the disease; from there it frequently made excursions northwards, but hardly ever got beyond the Balkan Peninsula and the countries immediately adjoining. Since the beginning of the present century it is only in the region last mentioned that plague has been epidemic from time to time; on the last occasion in 1814; and, excepting the slight

**Extinction in Europe.**

epidemic of the winter of 1878-79 in the Government of Astrakhan, it then vanished completely from the soil of Europe.

**Last outbreak in England. The Plague of London.**

In England the last great epidemic was that of the plague of London of 1665-66. *The number of reported plague deaths in the Metropolis in 1665 was 68,596, but the actual number was probably greater. In the year 1665 and still more in the year 1666, plague epidemics raged with varying degrees of severity in a number of provincial towns, which were probably infected from London. In

**Last outbreaks in France and Germany. The Plague of Marseilles.**

France the last outbreak occurred at Marseilles in 1720 and spread thence through Provence. The epidemic in Marseilles was one of the worst recorded in history. In Germany also the disease appeared for the last time early in the eighteenth century.

**Turkey, the starting point of plague in Europe.**

As the area of the plague in Europe became narrower, and the channels of its diffusion became more clearly marked, the more decidedly did Turkey stand revealed as almost the sole point of departure in Europe for every inroad of the pestilence. Even in some of the great epidemics of plague in the seventeenth century, it was possible to follow the track of the disease from the east, towards the northern, western, and central parts of the continent. That route was still more decided in the two severe epidemics at the beginning of the eighteenth century mentioned above; and it was very obvious in subsequent times down to the extinction of the plague in Europe, about the year 1840, that is to say, within the period when the disease existed nowhere out of Turkey, except in the countries of the Lower Danube and Southern Russia.

[1] Creighton's History of Epidemics in Britain.

Plague in Africa. Egypt, the starting point.

The part that was played by Turkey in disseminating the plague in Europe was played by Lower Egypt in the case of Africa. But in Africa the area of the disease was much more confined than in Europe, and it never spread beyond the belt of Northern States—Tripoli, Tunis, Algiers, and sometimes as far as Morocco. In Egypt itself the plague never extended above the first cataract of the Nile. The last epidemic of plague occurred in Egypt in 1843-44, in Tunis in 1836-37 and in Morocco in 1818-19. Since then Africa has been entirely free from plague except for two outbreaks that occurred on the Tripoli Coast in 1859 and in 1874. This portion of the country appears to have formed a new plague centre.

Extinction of plague in Africa except on the Tripoli Coast.

Old plague centres of Western Asia.

In the western portion of Asia the principal plague centres up to the end of the first half of the present century were Syria and Asia Minor, and to a lesser extent Armenia and Caucasia. In Syria thirteen outbreaks were recorded between 1773 and 1841, and in Asia Minor there are reports of twelve outbreaks between 1771 and 1839. The history of the plague in Caucasia is wanting in reliable information, but the disease seems to have been prevalent between 1798 and 1818.

In Armenia there were seven outbreaks from the beginning of the present century up to the year 1841. Since the outbreak of 1841 there has been no re-appearance of plague in these old centres of the disease.

Plague centres in Western Asia during the second-half of the nineteenth century.

Their place has, however, been taken by Arabia, Persia, and Mesopotamia, where previous to 1850 outbreaks of plague had been of rare occurrence. In Arabia epidemics occurred in 1815 and 1832; from that time onwards there was no outbreak until 1853, when an epidemic which arose in the mountainous district of Assir spread over the greater part of the country. Another widespread epidemic took place in 1874 and extended to within few days' march of Mecca, and there was a third epidemic in 1879. In the month of June 1897 the disease again broke out at Jeddah amongst the pilgrims from Hadramaut in the south of Arabia, and extended to the inhabitants of the town. Careful precautions were adopted and the epidemic was quickly stamped out. There is an account of an outbreak in Persia in 1571 and thence onwards epidemics occurred at rare intervals in the north-western portions of the country. There was a long interval free from plague between 1835 and 1863. In this latter year a severe epidemic broke out which was followed by other severe outbreaks in 1870, 1876, and 1877. In 1892 the plague spread from Persia into Turkestan. In Mesopotamia an outbreak occurred (at

Bagdad) in 1596 and there were three outbreaks between 1750 and 1842. An interval then occurred, with occasional isolated cases, which lasted to 1866 when a small local epidemic broke out in the marshy level of Hindieh on the west of the Euphrates. Six years afterwards (1873) plague re-appeared in the same locality and grew to an epidemic which lasted five years and overran the greater part of the country in wider and wider diffusion. In 1876 it appeared in Bagdad, and Hirsch considers that the estimate of 20,000 deaths in that place is probably much too small. In 1881 plague broke out again in Kerbela, Nejef and the neighbourhood.

**Plague in further Asia.**

Until recently it was commonly accepted that Persia was the eastern limit of the area of plague on Asiatic soil, and that during the last five centuries, at any rate, it had never penetrated beyond this limit. Recent experience has, however, shown the existence of plague centres in India and China which, even before the recent outbreaks in the Bombay Presidency and Hong-kong, excited the great interest of scientific investigators.

**India.**

The first trustworthy information of the occurrence of plague in India dates from the year 1812, when an epidemic broke out in Cutch and spread into Gujarat and Sind. In 1828-29 a disease absolutely like the Pali plague is reported to have been prevalent at Hansi in the district of Hissar in the Punjab. In 1836 another epidemic broke out at Pali in the Marwar State of Rajputana, and spread over a considerable area causing great loss of life. Along with these isolated outbreaks there exists an endemic centre of plague on the southern slopes of the Himalayas in the districts of British Garhwal and Kumaun. The existence of this centre can be traced back with certainty to the year 1823, and it has ever since been the scene of outbreaks of varying degrees of severity. A more detailed account of plague in India is given in the next chapter.

**China.**

In China the seat of the pestilence lies in the mountain valleys of Yunnan, a province situated on the borders of Upper Burma. The

**Yunnan.**

history of the disease in Yunnan is very obscure. It does not appear to have attracted notice before the virulent outbreak that occurred in 1871-73, at the time of the great Muhammadan rebellion, but some Chinese authorities allege that it existed from earlier times in the district of Ta-li-Fu in the extreme west of the province. The theory is sometimes put forward that the disease was imported from the endemic centre of Garhwal and Kumaun through either Thibet or

Upper Burma. *For over thirty years, at any rate, the pestilence has re-appeared year by year in different portions of the province of Yunnan at epochs varying for different districts, but as a rule regular for each locality. From the highlands the malady has extended to the elevated plain in the south of the province, and it now appears every year in the town and district of Mengtsz in the south of the province of Yunnan. Here the first cases occur regularly in May, at the season of the rice planting, and are said to be heralded by mortality among rats and pigs. As a rule, the epidemic does not last more than three or four months, and at its height twenty to thirty deaths are recorded a day. In the north of Yunnan the disease prevails chiefly in the winter. From Yunnan the pestilence has extended to the neighbouring provinces of Kwei-Chan and Kwangsi, and to the further province of Kwangtung, in which Canton is situated. At various intervals epidemics occur in these three provinces, but the disease does not remain permanently in the low regions of Kwangsi and Kwangtung. In 1882 a severe epidemic broke out in the seaport town of Pakhoi, south of the Kwangsi Province, where Dr. Rennie, writing in 1894, stated that the disease has been known for the last thirty years. He considered that the disease reached Pakhoi overland through the province of Kwangsi. In 1891 plague broke out in Kao-chao, the prefecture adjoining Lien-chou, in which Pakhoi is situated; according to the Chinese, it had spread northwards from that place. In the spring of 1894 it prevailed in severe epidemic form in localities between Kao-chao and Canton, and in March 1894 it broke out in Canton itself, having apparently travelled overland from Pakhoi. Dr. Rennie estimated that by the middle of June 40,000 people had died of the disease in Canton, and it is stated that not less than 100,000† persons in all died during the epidemic. In May 1894 the disease broke out in Hong-kong, reached a virulent height in the hot season and died away in September. The cases gradually rose up to 60 to 70 a day, and even to upwards of 90, and on one day to 109. About 2,550 persons perished before the epidemic died away. In January 1896 there was a recrudescence, the cases becoming more frequent in February and March, until in April and May the disease again assumed an epidemic character: 729 cases occurred up to the 5th May. In June, July, and August it gradually subsided. The second*

Mengtsz.

Pakhoi.

Canton.

Hong-kong.

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* Dr. J. L. Michoud's Report on the health of Mengtsz for the year ending the 30th April 1894, and Dr. Alexander Rennie's Report on the plague prevailing in Canton during the spring and summer of 1894.—(China Imperial Maritime Customs Medical Reports, 1894, Special Series, No. 2.)

† Paper by A. G. Viegas, L.M.S., published in the *Indian Lancet* of the 16th February 1897.

epidemic was less virulent than the first. The infection was probably brought from Canton on boardship in the ordinary intercourse of commerce.*

* Annual report by the Governor of Hong-kong (Sir William Robinson) for the year 1894.

Report by Sir William Robinson on the 1896 epidemic in Hong-kong, dated the 6th May 1896.

Report on the Epidemic of Bubonic Plague at Hong-kong in the year 1896, by Staff Surgeon Wilm of the Imperial German Navy.

Article in the *Lancet* of the 4th April 1896.

# CHAPTER IV.

## PREVIOUS HISTORY OF PLAGUE IN INDIA.

### Notices of Pestilence in early Indian History.

Virulent plague epidemics have occurred in India in former years.

The present Bombay epidemic has excited a special interest and a special anxiety owing to its having broken out in the Indian port in closest and most constant communication with Europe, and owing to the large area over which it has spread. But the summary given in the last chapter shows that the visitation is not the first of the kind that has been experienced in the west of India.

Possibility that the Black Death emanated from India.

The belief of contemporary writers that the Black Death originated in India or China has already been noticed, as well as the fact that the pulmonary form of the disease, which has been a marked characteristic of the present and previous plague epidemics in India, was equally a marked feature of the Black Death. Only *two direct references have, however, been traced which may point to the existence of plague in the west of India in the fourteenth and fifteenth centuries. The first is from Ibn Batuta, who notices that Muhammad Tughlak's army in Ma'bar (1325-1351) mostly perished of pestilence, and that at the end of the century (1399), after Timur left, the districts through which he had passed were visited by pestilence. The second relates to the year 1443, when pestilence caused such loss of life in the army of Sultan Ahmad I. that, leaving many of the dead unburied, he retired to Gujarat. Ferishta calls this disease *ta'un*, and speaks of it as very unusual in India. The famine† of 1590 to 1594 was followed by a pestilence that, besides hamlets and villages, depopulated whole cities. It must remain a matter of conjecture whether these outbreaks of virulent pestilence were epidemics of true plague.

Pestilence in India in the fourteenth and fifteenth centuries.

Notice of pestilence in the sixteenth century.

Twice in the seventeenth century the district of Ahmedabad in the Bombay Presidency was visited by severe epidemics of pestilence which were probably outbreaks of plague. The Bombay Gazetteer‡ gives the following description of the first of these epidemics, which appears to have been very widespread :—

Outbreak of 1618.

"The disease that raged in Ahmedabad in 1618 began in the Punjab in 1611. It is called the plague, *wába* or *wába-o-tá'aun*, and the works of the Hindus are said to have no mention of such a disease. It was thought to be connected with the comet of 1612. From the

* Bombay Gazetteer, Volume IV, p. 218.
† Bombay Gazetteer, Volume IV, p. 219.
‡ Volume. IV, Chapter XII.

Punjab it spread through Lahore, through the Doab to Delhi, and north to Kashmir. No place in Hindustan was free from its ravages. Lulling at times, it continued to lay waste the country for eight years. About the same time in Kandahar the land was overrun by mice, and mice and plague seem to have had some close connexion. A mouse would rush out of its hole as if mad, and striking itself against the doors and walls of the house, would die. Then the plague was in the house. If the people at once fled they might be saved; if they stayed, the whole village was swept away."

Outbreak of 1683 to 1689.

With reference to the second outbreak, which occurred during the period 1683 to 1689, the Gazetteer* makes the following remarks: "For several years before 1689 the plague, *taun* and *wába*, was again in Ahmedabad, and lasted for seven or eight years. The visible marks were swellings as big as a grape or banana behind the ears, under the arms, and in the groin, and redness round the pupils of the eyes." Hirsch repeats the following quotation made by Macpherson ('Annals of Cholera,' London, 1872, 112) from an Indian Chronicle which apparently refers to this epidemic: "A fever had prevailed for some years both in the Deccan and in Gujarat. It consisted of a slight swelling under the ears, or in the armpit or groin, attended with inflamed eyes and severe fever. It generally proved fatal in a few hours." Hirsch remarks that this description is suggestive of plague.

Eighteenth century.

It is stated in the Ahmedabad Gazetteer that during the eighteenth century, though none of the symptoms of the disease are described, there would seem to have been several outbreaks of a most deadly form of fever. In 1718, a year of famine, great numbers died of sickness; in 1770, another famine year, "on account of the unwholesomeness of the atmosphere, thousands of people died of fever in two or three days, so that no one could be found to bury them." Fearful disease is said to have accompanied the 1790 famine.

## The Epidemic in Western India in 1812 to 1821.

Gujarat epidemic of 1812 to 1821.

This is the first undoubted plague epidemic in India of which there is an authentic and trustworthy account. The disease broke

Origin in Cutch.

out in the Island of Cutch in 1812, and spreading thence over Kathiawar, part of the district of Ahmedabad, the Radhanpur State, and the southern portion of Sind, ravaged the country for a period of

Description of Cutch.

ten years. Cutch† is a native State of Gujarat situated to the south of Sind, from which it is separated by the Ran of Cutch. The capital is Bhuj, where the Chief or Rao resides. The whole territory of Cutch

* Volume IV, Chapter XII.

† See Map in Volume IV, page 1.

is almost entirely cut off from the continent of India, north by the great Ran, east by the little Ran, south by the Gulf of Cutch, and west by the east or Kosi mouth of the Indus. Though on the whole treeless, barren, and rocky, the aspect of the country is varied by ranges of hills and isolated peaks, by rugged and deeply cut river beds, and by well tilled valleys and tracts of rich pasture land. On the south, behind a high bank of sand that lines the sea-coast, lies a low, fertile, and well cultivated plain from twenty to thirty miles broad. There are no rivers in Cutch, but during the rainy season (July to October) many streams of considerable size flow from the central ranges of hills northwards to the Ran and southwards to the Gulf of Cutch. For the rest of the year the courses of these streams are marked by a succession of detached pools. Lying along the line of the tropic of Cancer, Cutch is almost beyond the rain-bringing influence of the south-west monsoon. The mean average rainfall for the five years 1891-1896 recorded at the different registration stations in the island was only 17·60 inches.

Along the sea-coast, throughout the year, the climate is agreeable; and over the whole province, for nearly nine months, it is cool and healthy. But in April and May burning winds and duststorms prevail, and again during October and part of November the heat becomes excessive.*

Account of the outbreak in Cutch.

The years 1811 and 1812 were marked by a severe famine which extended over the greater portion of Gujarat. At the close of the year 1812 plague broke out in Cutch with such virulence that it is said to have destroyed half the people of the country. The following account of the epidemic is taken from Volume V, Chapter XII, of the Bombay Gazetteer :—

"What along with the weakened state of the people must have strengthened, if it did not give rise to, this plague, was overcrowding in the towns, where on account of the disorders of the few preceding years, people from the village had sought shelter. For two years the disease abated. Then in May 1815, the year of the heaviest known rainfall, it broke out with deadly force in Kanthkot in east Cutch. As in Ahmedabad, its symptoms were slight fever followed by great weakness and weariness, and then swellings in the groin and armpits, suppurating in some cases and in others remaining hard lumps. Few stricken with the disease recovered. Most died between the third and ninth day. The plague seemed in the air; there was nothing to show that it had been brought from outside, or was spread by the touch. It seemed to attack most fiercely the sluggish and vegetable eaters; Rajputs escaped where Brahmans

* Imperial Gazetteer of India, Volume IV, pages 57-64.

and Vanias died in numbers; oil-makers were believed to be safe. In Bhuj, care was taken that no one should come from the affected districts. One man died, those with him were turned out, and the house was smoked with brimstone and unroofed. From Kanthkot the disease spread to other parts of Vagad (the eastern territorial division of the State), causing much loss of life in the early months of 1816. In May it crossed to Morvi in Kathiawar, and came back in August to within ten miles of Bhuj."

**Epidemic in the Radhanpur State and Sind.**

After 1817 there was no re-appearance of the disease in Cutch. At the same time that the disease spread to Morvi it raged in the Radhanpur State (lying to the north of Kathiawar and bounded on the west of the Ran of Cutch) and in Sind, occasioning a severe epidemic in the capital of this latter State (Hyderabad) in November of the year 1816.

**Description of Kathiawar.**

Kathiawar,* to which the plague spread in the spring of 1816, is a square peninsula, standing boldly out into the Arabian Sea between the smaller projection of Cutch and the straight line of the Gujarat Coast. It was formed into a political agency under the Government of Bombay in 1822, containing one hundred and eighty-seven separate States. For administrative purposes it is divided into four divisions: Jhalawar in the north-east, Halal in the north-west, Sorath in the south-west, and Gohelwar in the south-east. Lying midway between the dry deserts of Sind and the moist wooded Konkan, the province of Kathiawar partakes of the nature of both. At the same time it illustrates the transition between them by modifications of aspect ranging from the barrenness of the one to the richness of the other. Its shores, differing from the rocky coast line to the north and south of Bombay, resemble the coasts round the head of the Arabian Sea, and inland it shows every variety of scenery, from the arid and sandy tracts of Okhamandal in the west and Jhalawar in the east, covered with cactus and desert bushes, to the well watered forests of Gir in the southern range of hills, from the desolate waste of the Ran to the fertile and well cultivated region of the south; from the salt charged plains of the east and west to the rich seaboard tracts.

**Climate.**

The climate of the peninsula is in general pleasant and healthy. January, February, and March are marked by heavy dews and thick fogs, which are not unhealthy. The hot weather begins in April and lasts until the rain falls in the middle of June. The hot wind blows in various degrees in different parts, and is hottest in the south. On the sea-coast it is little felt. The hot weather months (April to June) are the healthiest in the year. There is always a light, cool breeze. The rains generally begin in force at the first change in the moon in

* See Map in Volume IV, page 1.

July and are spent by about the end of August. Unlike other parts of Gujarat, the rains are never severe and they grow lighter towards the west. Except that slight fevers prevail in July, no disease is specially prevalent between July and September. From the end of September the climate undergoes a change and becomes unhealthy. In September and October the heat of the sun is acutely felt, though the weather is cloudy. The latter part of November and the whole of December are in all respects like January.*

Accounts by contemporary Medical Officers.

Very interesting accounts have been given of the plague in Kathiawar by two Medical Officers who visited the country during the period of the epidemic. The first account by Dr. Gilder, Civil Surgeon, is contained in a letter dated the 20th February 1820 to the Bombay Medical Board, and the second by Dr. White, Assistant Surgeon, is contained in a letter of the 27th March 1820 to the same address. The two letters are reproduced in Appendix II, and the following account is derived from them and from Volume IV, Chapter XII of the Bombay Gazetteer:—

Commencement of the outbreak in Kathiawar at Morvi.

It has been stated above that the plague was introduced in May 1816 from Cutch to Morvi, the capital of a State of the same name, situated in the Halal division of the Kathiawar Peninsula on the western border of the Jhalawar division.

Spread to the Dhandhuka subdivision of Ahmedabad.

In 1817 the disease travelled to Dholera, a sea-port lying twelve miles up a creek of the Gulf of Cambay and situated in Dhandhuka, a subdivision of the Ahmedabad district lying to the south-east of the Jhalawar division of Kathiawar. It was believed that the disease was introduced into Dholera, a place of some importance in connection with the cotton trade, from Cutch, either by merchants or by the cotton ginners who came annually from Cutch with their wheels to separate cotton from its seed.

Dholera.

In Dholera three people only were attacked, all of whom died; the disease spread thence over the neighbouring British villages of Bariad, Rojka, Pipli, etc., and advanced westwards to Dhandhuka, the head-quarters of the subdivision, and situated near the border of Jhalawar. The epidemic continued in this neighbourhood and amongst villages on the border of the Ran until the close of the year 1817, when it gradually decreased without, however, altogether disappearing. Isolated cases continued to occur in the Dhandhuka subdivision and the neighbouring district of Limbdi in Jhalawar.

1817.

Spread to the Jhalawar division of Kathiawar.

In April 1819 the epidemic broke out with renewed virulence in the village of Bariad, a few miles north-west of Dholera. It raged here for two months until the setting in of the monsoon, and forty

1819.

* Bombay Gazetteer, Volume VIII.

families are said to have been annihilated. In the beginning of June the malady spread to Rojka, a village close to Dhandhuka, and nearly depopulated the place. During the rains of 1819 the malady became diffused over a large tract and manifested equal virulence in different parts of the country without, however, passing the western border of the Jhalawar division.

**Limbdi.** Towards the end of June the disease appeared in the town of Limbdi and made such ravages that the terrified inhabitants after losing fifteen hundred to two thousands of their number deserted the place, leaving their sick and a few persons to perform the rites for the dead. After this emigration the disease abated in Limbdi, but only to break out with increased virulence in other towns and villages of the neighbourhood, some of which are said to have been totally depopulated. The misery of the situation was aggravated by the fact that the rains were pouring down in torrents, flooding the country and forcing the inhabitants to crowd together in the infected villages, which rose like islands from a sheet of water. In 1821 the epidemic died away. Except for the 1816 outbreak in Morvi, the malady does not appear to have been diffused in Kathiawar beyond the limits of the Jhalawar division. Of the total mortality no estimate was made, but it must have amounted to a large proportion of the inhabitants of the stricken region. Dr. Gilder and Dr. Whyte agree that the disease was extremely fatal and that few recovered.

**Extinction in 1821.**

**Mortality.**

**Classes most affected.** It is said that persons of the Brahmin, Merchant, Goldsmith, Tailor and Kanbi* castes suffered most, and that the flesh-eating classes largely escaped. Dr. Gilder remarked that when once in any place the malady obtained hold over the members of any particular caste or trade it seldom abated without having made victims of them all.

**Symptoms.** Dr. Gilder gives a detailed clinical account of the disease, derived from native sources, in which he draws a marked distinction between the bubonic and pulmonary types, and gives a description of each, which tallies exactly with the description given in earlier and later epidemics. The natives had different names for the two forms of the disease; the bubonic form they termed *Ghant no rogue* or "the knotty disease;" the pulmonary form they distinguished by the appelations *Kogla no rogue* and *Tao no rogue*, signifying, respectively, "the expectorating disease" and "the fever disease."

**Pulmonary variety, the first to occur.** Dr. Whyte also notices the existence of the two forms, and states that in all cases the pulmonary form first broke out, and that the ordinary bubonic plague made its appearance afterwards. He gives the following description of a case of the pulmonary disorder which came under his observation: "In this man the heat of the body

* The principal cultivating caste.

was not much increased nor the pulse greatly accellerated; his bowels were not disordered nor did his tongue indicate much febrile irritation. He was able to walk about and converse, answering questions distinctly. No person would have thought him in danger, but there existed, in the patient's mind, a degree of alarm and anxiety altogether disproportionate to the apparent symptoms. He had only been attacked that morning. All his consideration seemed absorbed with a pain in his chest. He answered to my questions whether he had not other pain, as in his head, his back or limbs, that these were slightly painful; but he immediately recurred to his chest, dwelling upon that with a look of most painful distress; and if not questioned about other symptoms, it seemed as if he would not have mentioned them. He had besides a very slight cough,—so slight that it might easily have escaped unnoticed,—and this was accompanied with a discharge of blood from the mouth. The following day he was delirious, had a burning skin, with a very quick pulse. I searched for but found no buboes. He died in the course of the succeeding night, *i.e.*, in less than forty-eight hours from the first attack. The characteristic symptoms of this variety are, slight cough, pain of the chest, and haemorrhage from the mouth, attended with fever, but no buboes." Dr. Whyte also gives a description of the mild form of bubonic plague unaccompanied by fever. "I saw,"* he states, "a great number who had buboes, without any fever, and was told that upwards of one hundred and twenty had suffered in this way. These people walked about without either alarm or inconvenience, for none had died, and not many of the buboes suppurated." Mild bubonic form.

Dr. Whyte's report is divided into two parts. In the first part he gives a description of the matters that came under his observation in the different places he visited, and in the second part he states his general conclusions. Morvi, in the Halal division, and Wuccaner (Vankaner), Sura (Sara), Moolee (Muli), and Sily (Sayla) in the Jhalawar division were the principal places visited. It was three years since the outbreak at Morvi (1816) when Dr. Whyte made his tour. He stated that the situation and surroundings of Morvi were healthy and not such as predispose to ordinary malarial fevers, but that the whole space within the walls of the town was crowded with houses. The disease prevailed for five months in Morvi, beginning in the cold and lasting through the hot months without undergoing any modification on the occurrence of the change of weather. The accounts given of the mortality varied greatly. Dr. Whyte considered five hundred deaths to be a probable estimate. He with difficulty procured Dr. Whyte's report. Morvi.

* At Muli, in the Jhalawar division.

four recovered patients for examination, and instances this fact to show how few of those who were attacked recovered. The inhabitants of the town did not believe the disease to be contagious. The Thakur or Chief's brother had been in the habit of visiting and looking after the sick, frequently handling and touching them, and did this with complete immunity. Dr. Whyte inferred that casual intercourse with the sick is unattended with much danger, that it is probable that the disease is not readily communicated by the touch, and that it is possible that confinement in the same apartment is in general necessary for its production. The Thakur's palace, containing about one hundred people, escaped completely. It was a large well aired place elevated above the other parts of the town. Equal immunity was enjoyed by a small village situated on the opposite side of the river less than a quarter of a mile away on a very high and exposed situation, although there was daily and hourly communication between the village and the infected town. Vankaner is a large walled town, seated at the foot of a hill and on the banks of a fine river, distant about eighteen miles from Morvi. It is believed that the disease was imported from this latter place. The outbreak lasted only fifteen days and was almost solely confined to the Bohoras—a sect of Muhammadans whose occupation was the manufacture of cotton cloth. The number of deaths was estimated at sixty among this community, while not more than four or five among the rest of the inhabitants caught the infection. The Bohoras became so alarmed that they all left the town and went to live upon the mountains in the neighbourhood, leaving only the sick and their attendants. It is said that the whole of these very soon died. Whenever they heard of a death, the friends of the deceased came down and performed the last offices as speedily as possible, returning again to their abode on the mountains. Some of those who attended the funerals fell ill, but at the end of fifteen days after the Bohoras removed to the mountains, the disease had entirely disappeared from amongst them. When this was the case they all came down and re-occupied their houses, and they declared that no person was afterwards attacked by the disease. Dr. Whyte remarks "that this is a curious and singular fact, affording a rare instance of a measure dictated by fear, and carried into effect without reason or reflection, being attended with complete success." "In fact," he says, "it corresponds very nearly with what has been recommended to be done by one of our best writers, Dr. Adams, on such an occasion, and is a very good practical illustration of the measures, which with so much care, deliberation, and strict induction from the facts before him, he laid down and thought likely to be successful." Muli is described as a large and

Local belief that the disease was not contagious.

Beneficial influence of a healthy situation and abode.

Vankaner.

The Bohoras, or cotton weavers.

Suppression of the disease by removal to the open.

Muli.

populous town, the inhabitants of which are mostly Rajputs. It was surrounded by an old ruinous wall full of breaches, which were all carefully stuffed with thorns, and every house had a wall of the same material much higher than a man's head. "No better means could possibly have been adopted," says Dr. Whyte, "completely to exclude ventilation, if this had been the sole object of the inhabitants." At the time of Dr. Whyte's visit, the disease was still prevailing and had already caused about eighty deaths. It was at this place that Dr. Whyte recorded his clinical observations on the pulmonary and mild bubonic forms of the plague which are quoted above. Sayla is a large walled town in the neighbourhood of an extensive tank, which supplied it with excellent water. The disease had prevailed for about two and a half months at the time Dr. Whyte paid his visit. At first it had been very severe and general, but latterly it had become more partial in its attacks. Here also the Bohoras were the first and severest sufferers; one hundred and twenty deaths were said to have occurred, of which sixty were amongst the Bohoras. In some houses the loss had been very heavy, amounting to five, eight, or nine of the household.

Bad ventilation.

Sayla.

Dr. Whyte's report contains a long discussion on the origin of the disease and the way in which it spread. The opinions at which he arrived were very similar to those which are held at the present time. He believed that the disease spread from place to place by contagion (in the broad sense of the term), and especially by fomites, but that while it spread with facility in a close and insanitary situation, the reverse was the case in an open space and where sanitary conditions prevailed.

Dr. Whyte's discussion on the origin and spread of the disease. Spread by infection and fostered by endemic causes.

He describes in detail the endemic causes which fostered the growth of the disease in Kathiawar. The inhabitants were to the last degree uncleanly in their persons and habits, political causes had checked industry and agriculture and engendered idleness and want, and these evils had been aggravated by severe famine. It was also the habit of the people to live in crowded, dirty and ill-ventilated walled towns, and in the houses men and cattle (which were usually diseased), were herded together in the most unwholesome manner. The long duration and virulence of the outbreak can, under these circumstances, occasion no surprise.

Insanitary condition of Kathiawar.

In the remedial measures which he suggested, Dr. Whyte was also in agreement with the opinions that now prevail. "It is cheering to reflect," he remarks, "that we have arrived at the knowledge of a plan, by which, if its rules are rigidly attended to, we have it in our power speedily to check the progress of this scourge, in any place

Remedial measures suggested by Dr. Whyte.

where it may be introduced. * * * * These (rules), I need hardly add, are such as would secure cleanliness, and a complete separation of every family where the disease had appeared; they ought to be compelled instantly to depart from the town and live in the open plain, under a temporary encampment, which (if the subject were thought of sufficient importance) might be erected at the public expense for the lower orders. It would be well if the clothes of the diseased were to be burned at the public expense likewise. Experience has proved that, if not crowded, in such a situation the disease would not spread, and there can be no doubt the beneficial consequences would soon be a subject of joy and congratulation to every one who had a hand in promoting so benevolent a purpose." Dr. Whyte had little hope that these measures would be adopted in Kathiawar.

Segregation of the infected in the open, and destruction of contaminated clothing.

Outbreak in the Dhandhuka subdivision.

The outbreak in the Dhandhuka subdivision of the Ahmedabad District which spread from the sea-port of Dholera in 1817 has already been noticed. Dhandhuka forms the southern portion of the main body of the Ahmedabad District. The town of Ahmedabad is situated in the north-east corner of the main portion of the district and is some seventy miles distant from Dhandhuka. It is a flourishing town encircled by a belt of park-like country several miles in depth, and it is situated in the fertile plain of sandy soil which extends through the Daskroi and Dholka subdivisions which form the central portion of the district. The Dhandhuka subdivision lies in a fertile but treeless plain which changes towards the east to bleak, salty flats intersected by marshes.

Description of the Ahmedabad District.

Quarantine measures.

To stop the spread of the disease in the Ahmedabad District, the Collector ordered all heads of villages to allow no one to come from infected villages; if any one harboured people from a diseased village he and his family were to be turned out. Later on (January 1820) it was found necessary to keep people from going to infected villages to attend their relations' funerals, and village officers were ordered to turn any one out who had visited an infected village. But these harsh and stringent measures were powerless to check the spread of the disease. Notwithstanding the quarantine which was imposed at Dhandhuka, the infection found an entry and nearly depopulated the place. And at Ahmedabad itself "a contagion raged with a fury that can scarcely be believed." Of the symptoms of this sickness no details are recorded, but there can be little doubt that it was the same plague that was ravaging the neighbouring parts of the country. It is said that "every house sickened, whole families were carried off, and many a funeral party coming back to the house of mourning found that, in their absence, another member of the family had sickened and died. So thinned were some castes that their women had to help to carry

Quarantine ineffectual at Bhandhuka.

Pestilence at Ahmedabad.

the dead. All the fuel was burned and though houses were pulled down to supply logs, many bodies had to be left half consumed. Half of the people of Ahmedabad, perhaps about 50,000 souls, are said to have perished."*

High mortality.

Details of the outbreaks in Sind and Radhanpur are not ascertainable, and the above description therefore closes the account of the 1812—1821 epidemic. Its history is most important, not only because of the light that it throws on the disease, but because it affords an Indian example of the pertinacity with which plague will persist and the virulence with which it will prevail if left to work its way unchecked amidst insanitary surroundings.

Importance of the history of the Gujarat epidemic.

## The Pali Outbreak of 1836-37.

Hirsch notices a statement by Colonel Skinner that in 1828-29 a disease with glandular swellings absolutely like plague prevailed with malignancy at Hansi (Hissar district of the Punjab) in the province of Delhi. But the outbreak next following the Gujarat epidemic, of which there is a detailed and authentic account, is the epidemic that occurred in Rajputana in the years 1836-37 and which is usually known as the "Pali Plague." Dr. Forbes, one of the medical officers who investigated the disease, was informed by an intelligent Guru† of the Jains that, although new to his generation, the malady had formerly committed great ravages in Marwar.

Plague-like disease in the Punjab in 1828-29.

The Pali Plague.

An interesting account of this epidemic was written by Dr. James Ranken, Officiating Secretary to the Calcutta Medical Board, and published by order of the Government of India in 1838. The following description is mainly derived from this report and its appendices. Dr. Ranken did not himself visit the scene of the epidemic, but compiled his report from documents written by the medical and other officers who were on the spot. Differing from the doctors who saw the disease, Dr. Ranken did not believe it to be the plague of history, but his arguments to this effect are inconclusive, and the clinical and epidemological accounts of the outbreak show beyond doubt that it was one of true plague.

Dr. Ranken's report on the Pali plague.

The scene of the Rajputana epidemic was the country lying on either side of that portion of the Aravulli hills which forms the district of Merwara, under British administration.

Description of Marwar, Mewar, and Merwara.

To the west and north of the range of hills lies the state of Marwar or Jodhpur, and to the east and south the state of Mewar or Udaipur. Marwar forms the south-eastern portion of the Rajputana desert

* Bombay Gazetteer, Volume IV, Chapter XII. | † Spiritual guide.

country. The cultivation is poor and precarious, though certain parts have a better soil than others, and some tracts are comparatively productive. The principal towns in this part of Rajputana are well built and fairly prosperous, and have for ages managed the traffic across the desert The climate of Mewar is healthy and not malarial. It is remarkably dry, and the country is altogether free from heavy jungle. The soil is for the most part light and sandy: there are few natural or artificial collections of water, and the periodical rains speedily drain off. The portion of Mewar affected was the fertile open and undulating country comprised in the north-east portion of the state. The intervening range of the Aravulli hills forms a narrow strip of territory with mountainous and varied scenery; the highest peak attains an elevation of 2,855 feet above the sea-level, and the average level of the valleys is 1,800 feet. The country is naturally dry and unproductive, but is rendered comparatively fertile by numerous tanks (formed by embanking gorges or torrents), most of which have been constructed since the introduction of British rule.

**Outbreak at Pali, July 1836.**

The disease broke out in the month of July 1836 at Pali, a considerable town in Marwar, distant about thirty-five miles as the crow flies from the nearest point of the Aravulli hills. Pali was reckoned the emporium of trade between Central India and the sea-ports of Gujarat, and in 1836 was believed to contain about fifteen to twenty thousand inhabitants. A number of families amounting to about two thousand persons, called Chipis, who lived by printing the plain pieces of cloth brought from the coast, were the first affected; and six hundred and fifty-five of them died. The Brahmans next, then the Mahajans, or retail merchants, and the inhabitants indiscriminately were taken ill in succession. The outbreak was virulent and it is believed that four thousand inhabitants perished, the deaths amounting to fifty or sixty a day. "Before the mortality abated, all the wood procurable for burning the dead was expended, and corpses had to be consumed with the shells of cocoanuts, and the butter commonly used as food." The origin of the disease in Pali is not known. One conjecture that was formed was that the infection was brought in the bales of cloth imported into Pali from Bhavnagar, Surat, and other western ports. The fact that the persons first attacked belonged to the class who handle this cloth for printing lent some support to this view. Dr. Irvine, who was at the time Surgeon to the Political Agency, Rajputana, has recorded the following interesting remarks on this subject:—

**The cloth-printers first affected.**

**Virulence of the epidemic.**

**Origin of the disease. Conjecture that it was imported from the Gujarat ports.**

**Dr. Irvine's reason for believing in this theory.**

"It appears to me, in the first place, that the plague having previously appeared in obscure parts of India is very nearly proven as a fact; and history declares that at one period, a most fatal contagious plague desolated the whole country. In various places in Gujarat

cases of disease have been observed by the Bombay Medical Officers, appearing either sporadically or partially epidemic, the symptoms of which closely assimilated those of the true plague; and, I believe, that only the supposed impossibility of the existence of that disease in India prevented those cases being declared such.

"It appears that in those instances the disorder broke out and subsided, and again appeared at different periods. From which I conclude that the disease, at each time of its appearance, was freshly imported, either by land or sea, in bales of merchandise containing the fomites of the plague; which disease, after breaking out, was in those cases soon arrested in its progress by the occurrence of great heat and an arid atmosphere, and a probably small population to act on. It would seem very likely that, had the plague never reached Pali, the disease might still have appeared sporadically to the westward, and yet never have from its insignificance been ackowledged as such. From the great increase of land transport *vid* Pali, it is not at all to be wondered at that goods infected with the fomites of plague at last reached that place; it is rather a matter for admiration that such had not occurred before, under the absence of every precaution. It is equally evident that for a long series of years goods may be imported from even infected quarters, and yet not contain the fomites of the plague; but, at length, one infected package arriving may do all the mischief. That the plague was thus introduced into Pali I have not a doubt, especially from the circumstances of the disease not having appeared at intermediate towns, between Pali and the coast; from which it would seem probable that the package containing the fomites was at once conveyed unopened from the vessel it came in to Pali where it spread the pestilence; more particularly as it is a well known fact that the period that unopened goods will retain the fomites of plague is almost unlimited, though the time the human frame will retain the hidden seeds of the disorder is not beyond eight or ten days: hence it seems evident that the contagion reached Pali retained in bales of merchandise and was not introduced by men infected with the malady."

Flight of the inhabitants of Pali.

"In the course of five or six weeks from its first appearance, the disease having committed great ravages, and the daily mortality being still on the increase, all ranks of the townspeople became so much alarmed that they began in considerable numbers to abandon alike their homes, occupation, and property, and to seek refuge in Jodhpur, Sujit, Khairwali, and other towns and villages within a circle of twenty to thirty miles round Pali. The wealthier members of the community were the first to emigrate; others soon followed their

example, and to such an extent that (with the exception of the Chippahs) only the very poorest remained in the outskirts of this once rich and thriving town." Almost all the long narrow streets and alleys were left tenantless, every shop was shut, and, according to Assistant Surgeon Maclean, who visited the town at this period, and from whose account the above description is taken, not more than a thousand persons, mostly of the very poorest class, were left in the place. The Assistant Surgeon continues his account of the flight as follows :—

**The disease spread by the refugees.**

"Of the thousands of persons who quitted Pali * * * some were at the time labouring under disease, others fell sick on the road or immediately after they had reached their destined places of refuge. For a short period after their arrival in the various towns in which they had taken up their temporary abodes, the sickness which they had brought in their train adhered to the refugees, without attacking the inhabitants of those towns. But this state of things did not long continue. The classes with which the refugees had the most intimate communication (bannias* for instance) speedily began to feel the effects of the Pali scourge, and *now* there is not a town or village, to which the refugees resorted in any considerable numbers, which is not become a fresh focus of contagion and in which the original malady does not rage with fearful vigour."

**Progress of the plague in Marwar and Mewar.**

In September the epidemic extended to Sujit, a town containing six thousand souls, and by October it reached Jodhpur, the capital of Marwar (about fifty-two miles in a direct line from the hills), and spread over the intervening towns and villages. It next affected the single village of Dewair in the Merwara hill district, where it destroyed four hundred persons. Passing over the hilly tract it attacked Deoghar in Mewar, on the east border of the hills, and skirting the hills towards the north-east, it extended fifty miles by Lusani Thana and Bednore to Jalia and Ranghar in the district of Ajmere. At the same time it extended over the southern portion of the open Mewar country. These events occurred in January to March 1837. In April 1837 the sickness was announced in Bhilwara and Hamirgarh in the extreme east of the Mewar plain, towards the direction of the British cantonment of Neemuch. In all thirty-two villages in Mewar were attacked by the epidemic. The hot season of 1837 was unusually mild, but nevertheless the hot weather and winds were found to have a beneficial effect in checking the progress of the disease. Towards the end of 1837 the epidemic broke out again in Pali, and it did not die out until the spring of 1838. No accurate estimate was made of the total mortality. Dr. Irvine states that

**Extinction in the spring of 1838.**

* Retail vendors.

thousands died in Jodhpur, and Assistant Surgeon Maclean believed that the assertion of the Marwaris that a hundred thousand persons perished of the plague in their country was not very far wide of the truth. He estimated that when the epidemic had reached a virulent stage, not less than three-quarters of the sick died. Mortality.

Dr. Ranken states that at the same time that the plague raged in Rajputana, common remittent and intermittent fevers prevailed in Jilwara and Jaipur, and Rohilkhand was ravaged by an infectious and deadly epidemic resembling yellow fever. Hirsch remarks that it was stated by Dr. Guthrie that, while the plague was at Pali, there was a pestilence observed over the whole country round Bareilly (Rohilkhand), which had precisely the same characters. The appendix to Dr. Ranken's report contains a note by Dr. Guthrie (Civil Surgeon) on the subject of the Bareilly fever. The symptoms he describes seem to be those of relapsing fever rather than plague, and are in some respects widely different from the ordinary symptoms of plague. In only one instance did Dr. Guthrie observe any enlargement of the glands, but occasionally the illness was marked by severe pains in the throat and chest, with cough and expectoration. Dr. Guthrie's note is reprinted in Appendix II. Contemporaneous yellow fever in Rohilkhand. Dr. Guthrie on the Rohilkhand fever.

The symptoms observed in the Pali epidemic were similar to those of other plague epidemics in India. The disease was commonly of the bubonic form, but the pulmonary variety was also sufficiently well marked to excite special attention. The following is the account given by Assistant Surgeon Maclean, who saw numerous cases of the malady:— Symptoms. Bubonic and pulmonary forms. Description by Assistant Surgeon Maclean.

"The attack is generally sudden, without previous feeling of indisposition; the patient is seized with rigor, usually slight headache, pains of the loins, nausea, etc.; the skin soon becomes hot and dry, and the pulse frequent, generally soft and easily compressible, seldom full and bounding and rarely or never hard. I counted a great many pulses; they were all frequent, often 130, 140, 150. This might in some measure be attributed to the exertion necessarily made by the patients while being carried to the doors of their houses from the interior. In many cases, however, where the patient was not moved at all, I found the pulse equally frequent. Tongue usually covered with a white or light brown fur. Sometimes it was nearly clean, chiefly where the disease was of recent date. Vomiting did not appear to be common at any period of the disease. I saw, however, a few cases in which there was much irritability of the stomach, manifested by frequent and distressing retching. Bowels generally bound in the early stages of the disease, abdomen rather tumid and hard, and almost always free from pain on pressure; considerable

thirst. Eyes commonly heavy and hazy; often bloodshot. Countenance in all the severer cases expressive of much anxiety and suffering. Respiration generally easy, excepting in patients having inflammation of the lungs as the prominent feature of their malady.

"Buboes appear in the groins, armpits and neck (usually on the left side), sometimes almost simultaneously with the fever, but more commonly in the course of the first or second day—rarely so late as the third or fourth. They are at first of small size, moveable, and always acutely painful to the touch. In some few cases they increase rapidly in bulk, suppurate, and discharge pus alone, or mixed with shreds of dead cellular membrane. In by far the greater number of instances, however, they do not become larger than a walnut, and show no disposition to suppurate. The groins are the situations in which the buboes appear most frequently.

"Sometimes there is one in each groin, sometimes in one groin and one axilla, sometimes in one or both axilla and neck, in one or both groins and neck, or in the neck alone. Suppuration and even rapid increase of size without suppuration have been remarked by the Pali people to be favourable symptoms. In persons who recover from the disease, the buboes most frequently disappear gradually of their own accord. I saw one man, however, in whom a bubo, in the left groin, had attained a great size, and was likely to prove very troublesome. It extended from the pubis to near the anterior superior spinous process of the ilium, and was hard and painful. In this patient the fever had ceased four days before I saw him. In this disease a remission of the febrile symptoms, more or less marked, takes place towards morning, the remission being of longer or shorter duration according to the mildness or severity of the malady in each individual case. In the worst cases there is no perceptible remission. In some the disease was so mild that the patients walked without assistance from their houses to the place where I was standing, had their buboes, pulses, etc., examined, swallowed their medicine and walked home again. In others, again, syncope followed any attempt to raise them from their charpoys. The head is but rarely affected in the early stages of the disease. Most of the persons I saw answered questions readily and distinctly. In fatal cases the patients become comatose some hours before death.

"In a small proportion of cases inflammation of the lungs comes on, on the first or second day of the disease. The patient complains of acute pain of one or other side or behind the sternum; great difficulty of breathing; short dry cough; usually on the second or third day a small quantity (rarely more than half an ounce) of florid blood, in small coagula, is expectorated. In such cases buboes are

not commonly observed, though they do occasionally coexist with the inflammation of the lungs. The mortality has been so great among those in whom the lungs were affected that a person now, on seeing blood in his sputum, gives himself up for lost."

Infection carried from place to place.

It has been stated above that the origin of the Pali outbreak is not known though it is surmised that it may have been imported from the Gujarat ports. The history of the epidemic shows that the infection was carried from place to place. All the authorities are agreed that the spread and virulence of the epidemic was largely fostered by dirty and insanitary conditions of life, as Dr. Ranken puts it, "under the influence of an atmosphere accidentally more impure than ordinary, in foul and ill-ventilated huts, amidst the privations of the poorer classes in Marwar and Meywar." In Chapter II a quotation has been given showing the insanitary condition of a typical Rajputana village of the time. The following general remarks recorded by Dr. Ranken are to the same purport:—

Epidemic fostered by dirty and insanitary conditions of life.

Insanitary condition of Rajputana.

"The people of the North-Western Provinces of British India, and of Marwar more especially, are to be considered in varying stages of transition from anarchy and want to comparative plenty and order. They have advanced within reach of many improvements in the physical conditions of society, but having made no corresponding acquisitions in intelligence, their minds retain the impress of former barbarity and misrule, and are yet unable to turn the advantages of a better system to account. Hence animal instinct predominating over foresight and enterprize, population has augmented faster than increasing agriculture and commerce have extended. The hut, or one of the same dimensions, which was the unwholesome den of four persons, for example, fifty years ago, now shelters six human beings within a space barely sufficient for the accommodation of one. These miserable habitations are often enclosed by an outer screen or wall, for the double purpose of confining the cattle and secluding females from the public gaze. Glass to let in light or apertures to admit fresh air being unknown, the door, in order to keep out heat at one season and cold at another, is generally shut. The poor feel most at home in such dark places with their children lying round them on the floor, too much like hogs in a sty amidst their litter. The sense of insecurity for life and property which deterred their ancestors from living near the fields which they cultivated, in farms, houses and cottages scattered over the face of the country, owing to hereditary habits of thinking, still perceptible to this day under the very cannon of Fort William, makes the peasantry everywhere accumulate their hovels within the narrowest limits, and the

consequence is that each dirty village, unventilated, and overcrowded with man and beast, exhibiting every sort of nastiness, is a focus of disease."

**Mortality greater in large than in small villages.**

Assistant Surgeon Maclean remarked that in large, irregular, closely built villages the mortality was greater than in the smaller ones. The smaller villages were for the most part as filthy as the larger ones; but their small size alone, particularly when coupled with an open situation, was of signal advantage to the inhabitants, by allowing the pure air to penetrate more freely into the recesses and corners in which the native sick were commonly lodged.

**Land quarantine and preventive cordons.**

An endeavour was made to prevent the spread of infection by the imposition of rigid land quarantine. The preventive lines and cordons that were established are shown in the map in Volume IV, page 2. To protect the Bombay frontier a cordon line was drawn between Balmir and Bhinmali to the south of the infected portion of Marwar. A similar line was established along the north of the Mewar territory from Luluah on the western slope of the hills to Sawar on the Banas River, and another along the south of the infected part of Mewar. Captain Dixon, Superintendent of Merwara, established a cordon along both sides of the hill district. Preventive lines and strict quarantine were also established around Ajmere, Neemuch, and Nasirabad. A thousand armed horsemen patrolled the cordon lines established for the protection of the North-Western Provinces. The Princes of Jodhpur and Udaipur were requested to prevent the spread of the disease by blockading the places belonging to them in which it prevailed, but it is believed that they did little in this direction.

**Dr. Ranken's opinion on the subject of land quarantine.**

Dr. Ranken considered that quarantine and sanitary cordons lessened the chances of infection by intercepting persons with the disease in their constitution who might otherwise have taken refuge in some hovel in uninfected territory where the sickness was likely to break out and spread. He was in favour of the blockade of infected places provided accommodation were increased within the infected area to allow of proper sanitary arrangements being made for the infected population, but he believed that it was not possible to render preventive lines embracing long frontiers really effectual, and he was of opinion that suppression of communication between neighbouring districts was a measure calculated to spread infection by causing famine and disease. "The suspension of the internal trade of conterminous districts," says Dr. Ranken, "depriving the farmer of a market for his produce, the merchant of the use of his capital, and consequently the labourer of employment, diminishes or takes away that supply, in the continuance

of which the improvident and pennyless mass of the people depend to-day for subsistence to-morrow. Nothing, in short, appears to me more calculated than an efficient cordon to assist famine, disease, and with the concomitance of an impure atmosphere, the very infectious or contagious fever which it is intended to eradicate. The combined coercion, restraint and oppression subversive of the functions of society, which the system of quarantine involves, are inferior only to the horrors of plague when it actually prevails." Dr. Ranken attributed the comparative immunity of Merwara and the escape of the civil and military stations in British territory to their superior sanitary condition rather than to quarantine and preventive lines.

Breach of the Merwara cordon.

The Merwara cordon did not prevent the infection from invading the hill tract. It was broken on the western line, and a village in Merwara (Dewair) was attacked by the malady, which did not, however, spread to other parts of the district. In the neighbourhood of Dewair there was a much frequented pass, connecting Marwar and Mewar territory. It was discovered that certain people of the Dewair district, who gained their subsistence by acting as guides to travellers crossing the Merwara hills, were (after Captain Dixon had closed the main road) in the habit of conducting travellers into and through the Merwara districts by bye-paths and during the night when discovery was difficult or impossible.

Dr. Ranken's advocacy of sanitary reform.

The measure in which Dr. Ranken had the greatest confidence was sanitary improvement, both in the condition of towns and villages and in the condition of the people themselves. "The most comprehensive injunction that can perhaps be given on this subject," he states, "of paramount importance to public health, is to prevent the contamination and promote the circulation of the atmosphere, and to let no water stagnate on the surface of the ground * * *. If earnestly acted on, a great change for the better must soon appear. It is very possible for an active magistrate to get the streets cleaned of rubbish, dung-hills and other filth; dead walls, fences, jungle and planted trees removed from the areas and outskirts of the place; and to make the inhabitants drain or fill up puddles. The benefit derivable from such obvious and practicable means would far exceed the expectation of those to whom the subject is new." In especial he earnestly advised the Government "to begin the amelioration of the country by making Calcutta, the capital, a model by which other stations may be improved in a manner which shall render them less sickly at all times, and comparatively safe from the occasional irruption of diseases resembling plague."

Advice with regard to Calcutta.

In describing his experiences at Jalia (south of the Ajmere district) Dr. Irvine stated the measures on which he would rely for combating an outbreak of plague—

**Dr. Irvine's opinion that the healthy should encamp outside the infected place.**

"At Jalia, the healthy portion of the inhabitants were directed to leave the town and encamp around the walls for a time, until the plague should entirely subside, the sick alone to remain, to whom I would attend: all filth and dirt lying in the streets or about the houses was ordered to be collected and burnt outside the walls: the healthy portion were ordered to wash all their wearing apparel on leaving the town: and when the disease should be diminished, the houses were directed to be new "liped"* with cow-dung, in the absence of whitewash, ere re-inhabiting them. Had these instructions been fulfilled *bonâ fide*, I have little doubt that the plague would have been quite arrested at Jalia; but the apathy of the natives has occasioned them to be altogether evaded or only partially performed."

**Cleansing of apparel and houses.**

At a later date Dr. Irvine recorded the following remarks about the possibility of combating the disease:—

**Disease easily eradicated on the occurrence of a few cases in a small place, but impossible to arrest when it obtains a hold on a large town.**

"From what I have myself observed of the plague, it appears that in a small place where only a few cases occur it is very easy to be eradicated; but, let the malady once take a firm hold in a large populous town, to arrest the progress of the scourge will be found in India an impossibility."

## Mahamari—the Himalayan Plague.†

**Endemic plague centre in the Himalayas.**

Along with the plague epidemics that have occasionally visited India, and, in so far as the evidence goes, unconnected with them, there has existed for a long time past an endemic plague centre on the southern slopes of the Himalayas. The bacteriological origin of this disease has not yet been investigated, but its clinical and epidemological history leave little doubt that it is true plague.

**Garhwal and Kumaun.**

The home of the disease is in the North-Western Provinces Districts of Kumaun and British Garhwal.

The area of the two districts is over 11,000 square miles, and they contain a population of close on 1,000,000 persons, living at elevations from 1,500 to over 11,000 feet above the sea-level.

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* *i.e.*, smeared.

† Surgeon-Colonel Hutchinson (formerly Sanitary Commissioner of the North-Western Provinces and Oudh); Report on Mahamari (Appendix II). Mahamari, or Indian Plague: its origin, progress and eradication; Reports of Drs. Francis and Pearson; Indian Annals of Medical Science, No. II, April 1854. Mahamari; Dr. Stiven's Report; Indian Annals of Medical Science, No. III, October 1854 (Appendix II).

The first authentic record relates to an outbreak which occurred in 1823 at Kedarnath in British Garhwal. At Kedarnath there is a famous shrine much visited by pilgrims. Local tradition asserts that the disease originated in the person of the high priest who, having deviated from the rules prescribed in the sacred writings for the performance of the religious ceremony called "Hom," was smitten with this new form of disease, together with the Brahmans who assisted at the offering. From Kedarnath the disease spread to the villages in religious assignment to the temple, and afterwards to other parganas * of Garhwal. During the first half of the century the general tendency of the disease was to spread from north to south. Since the outbreak of 1823 the malady has prevailed off and on up to the present time. There are records showing that the disease was present in some part or other of the two districts in the years 1834, 1835, 1846, 1847, 1849, 1850, 1851, 1852, 1853, 1854, 1859, 1860, 1870, 1875, 1876, 1877, 1884, 1886, 1887, 1888, 1891, 1893, 1894 and 1897. Since 1834 the outbreaks have thus been of constant recurrence, except during the period 1860 to 1875. Some of the outbreaks spread over a number of villages and occasioned great loss of life; others were confined to a small area. In the outbreak of 1834-35, the ascertained total of deaths was 633, and in 1851-52 567 deaths were reported to have occurred in seventy-seven villages. In 1853-54 the epidemic spread to the plains and attacked places in the Bijnor and Moradabad districts and in the Rampore State. An article in the Indian Annals of Medical Science, April 1854, on the subject Dr. Stiven's report on the appearance of the disease in the plains is reproduced in Appendix II. He gives some account of the epidemic at Thakurdwara in the north of the Moradabad district, and the manner in which the disease was there introduced by a refugee from a neighbouring infected place. *Mahamari* was at the same time prevalent at Atzalgarh in the Bijnor district, and at Kasipur in the Tarai in the extreme south of Kumaun. It is stated that about 8,000 persons lost their lives. The period from 1850 to 1854 appears to have been the worst on record. The considerable mortality and the tendency which the disease showed to spread to the plains occasioned much anxiety. The Government of the North-Western Provinces sent officers to study the disease and to find means to stop its ravages. In 1860 nearly 1,000 deaths occurred. In 1877-78 the epidemic which extended over eight parganas caused 550 deaths. None of the later outbreaks appear to have been widespread or to have attacked large numbers of persons.

The 1823 outbreak at Kedarnath.

Subsequent outbreaks.

Outbreaks sometimes virulent, sometimes slight.

1834-35.

1853-54. Spread to the plains.

1860.

1877-78. Later outbreaks not severe.

It must at first sight occasion surprise that constant outbreaks of plague should occur in villages scattered over the mountain side,

The disease fostered by

* A revenue division.

dirty and unwholesome surroundings.

open to the pure air of the hills, and supplied with water from the mountain streams. Here, as elsewhere, the explanation lies in dirty and insanitary conditions of life. In another place a description has been given of a typical Garhwal village, with its ill-ventilated houses of which the ground floor is crowded with cattle, and its accumulations of filth and refuse. The following passage occurs in a report written by Dr. Rennie, who investigated the disease locally in 1850:—

"The filth is everywhere—in their villages, their houses and their persons. It destroys the otherwise pure quality of the air, and maintains ever round the inhabitants that contaminated atmosphere so favourable to the condensation of infectious emanations. Their dwellings are generally low and ill-ventilated, except through their bad construction; and the advantage, to the natives in other parts of India, of living in the open air is lost to the villagers of Garhwal, from the necessity of their crowding together for mutual warmth, and shelter against the inclemency of the weather. The food of the majority is bad and insufficient." It is stated in Dr. Stiven's report that the infection of *mahamari* spread from the house in which the first cases occurred over Thakurdwara, "curiously enough, however, choosing the most populous, crowded, ill-fed and filthiest parts of the *Kasba* for its development." In the more healthy quarters of the town, it is stated that only one case occurred, which ended in recovery.

Symptoms.

The symptoms and characteristics of *mahamari* are identical with those of ordinary plague. The usual symptoms are shivering, quickly followed by intense fever, ending in delirium, insensibility and death on the third or fourth day; also the characteristic enlargement of lymphatic glands, except in some of the severest cases, where death ensues during the first three days from extreme virulence and shock of the great nerve centres.

Virulence of the disorder.

The disorder is extremely fatal and only a small proportion of the persons attacked recover. Instances are given in which all or nearly all the members of a family living together have been attacked and died. In Dr. Rennie's reports of 1850 it is stated that "the mortality from *mahamari* is very great, not so much in actual numbers as relatively to the small amount of the population. The recent mortality has been estimated by the civil authorities to be probably twenty-five per cent. on the total population. Recent enquiries show it to have been even greater; but the statistical details are most defective. In certain places the destruction has been very great, of which an example has been given, of fourteen deaths out of sixteen people in one place. In the village of Sarkote in 1846-47, if the reports of the inhabitants are to be trusted, out of a population of sixty-five in all, forty-three died, two only recovered, and twenty

escaped without infection." The villagers are terrified at the disease, and it is now their common practice to flee from a village in which it has broken out and to camp on the hill-sides. Experience has shown them that to leave the plague-infected locality is their best chance of escape.

Flight of the inhabitants from infected villages.

Dr. Hutchinson classes the outbreaks into two kinds: spontaneous outbreaks and outbreaks caused by the importation of the disease. The outbreaks are frequently associated with, and sometimes preceded by, a great mortality among rats. All the civil and medical officers who have observed the disease lay the strongest stress on this marked characteristic. It is said that no other animals have been attacked. An instance is recorded in which the inhabitants of a village promptly left it on the occurrence of a great mortality among the rats, and thus probably saved themselves from an attack of the pestilence. Dr. Hutchinson ascribes the ever-recurring recrudescence of the plague in this portion of the Himalayas to the germination of a specific poison, and its spread by fomites and other means through neglect to destroy articles, etc., likely to convey and retain infection for long periods, and to the imperfect burial of the dead in epidemic and at other times. Modern research on the general subject of plague points to mild sporadic cases, and the preservation of the bacilli in contaminated articles kept under conditions favourable to the vitality of the microbe, as the probable means whereby the infection is preserved between successive epidemics.

Spontaneous and imported outbreaks.

Mortality among rats.

Spontaneous outbreaks how caused.

Assistant Surgeons Francis and Pearson, who made a local investigation of the disease in 1852, drew the following "practical deductions" from their observations:—

"*First.*—*Mahamari* and plague are identical.

*Secondly.*—The disease is of local origin; capable of transmission from person to person, and from place to place.

*Thirdly.*—That it is gradually extending itself; and that no sufficient grounds exist for the supposition that it will never be developed in surrounding countries.

*Fourthly.*—That the local circumstances, upon which *mahâmari* depends, should be done away with, and sanitary measures introduced; in which case, it is probable that the disease will be gradually eradicated, or, at any rate, modified in severity.

*Fifthly.*—That it is likely the disease, if dealt with early, will be found to be curable; and that the people themselves may use the remedy furnished by authority."

The last outbreak, which occurred in the spring of the present year, occasioned particular notice and anxiety as it was contemporaneous with the worst period of the Bombay plague. The

Outbreak of 1897 at Okhimath.

locality was a small village near Okhimath on the main road of pilgrimage from Hardwar to Kedarnath, and some 20 miles distant from the latter place, which was the scene of the 1823 outbreak.

At the commencement of the attack some of the inhabitants, following the usual practice in such cases, left the village, which was very small, remote and inaccessible, and thus escaped infection. Only four or five families remained, most of the members of which died of the disease. There were 17 deaths in all. As soon as information was received by the authorities, the villagers who had not already left were removed and segregated, the houses were burnt and orders were issued that the site, which was water-logged and insanitary, should not be re-occupied. The neighbouring villages were thoroughly cleaned. These careful precautions were successful, and the infection did not spread. The direct pilgrim route through Okhimath was kept closed during the time that the danger of infection was apprehended.

**Preventive measures adopted.**

**Their success.**

**Closing the pilgrim route.**

Future outbreaks of the disease will require to be met by careful precautions, and the general insanitary condition of the villages is deserving of attention. On one occasion, at any rate, the plague is known to have spread from the hills to the plains and to have occasioned considerable loss of life. The experience of the past year, as well as the experience of former outbreaks, shows that the conditions of a large part of India are not unfavourable to the spread of plague, if it once assumes an epidemic form. Hardwar, the great pilgrim centre, is not far from, and is in communication with, the area where the pestilence lurks, and has been attacked by plague during the present epidemic. Lastly, Dr. Hutchinson points out that the disease might prove disastrously fatal if it spread to the overcrowded communities of the hill sanitaria which exist in the immediate neighbourhood.

**Danger of the spread of *mahamari*.**

# CHAPTER V.

## EXTENT AND COURSE OF THE PLAGUE IN THE BOMBAY PRESIDENCY.

### Preliminary Remarks.

It will not be necessary to give a very long or detailed description of the course and extent of the epidemic in the Bombay Presidency.

Statistics, charts, and maps.

The statements in Appendix III and the maps and charts in Volume IV furnish as clear a picture of the epidemic as any verbal description could convey. The statements, charts, and maps include the period from the first outbreak until the end of August; they thus carry the account through the entire period of the first portion of the epidemic and through the beginning of the recrudescence which has since attained to such great proportions. The account given in this chapter will deal mainly with the first period of the epidemic, but a few remarks will also be made about the recrudescence.

Description of the Presidency.

A brief description will first be given of the Bombay Presidency, its physical aspects, climate, political divisions and form of administration. To those who are not familiar with the subject the account will make clearer the description of the epidemic and of the measures taken to combat it which is given in the present and following chapters.

### Brief description of the Bombay Presidency.

Sources from which the account is derived.

The following account of the Bombay Presidency is derived from Volume III of the Imperial Gazetteer of India, with the exception of the description of the climate which has been prepared by Mr. W. L. Dallas of the Meteorological Department of the Government of India.

Extent and population.

*Extent and population.*—Bombay, the Western Presidency of British India, is divided into four revenue divisions and twenty-four British districts. It also includes numerous Native States under

the protection of the Government of India. The territory thus composed extends from 13° 53′ to 28° 45′ north latitude and from 66° 40′ to 76° 30′ east longitude. The British districts, including Sind, contain a total area of 125,064 square miles, and a total population (according to the census of 1891) of 18,857,044 souls; the Native States under the Bombay Government, excluding Baroda, cover an additional area estimated at 69,045 square miles, with a population of 8,05,298 souls; grand total area, 194,109 square miles; grand total population, 26,916,342 souls. The State of Baroda, with an area of 8,226 square miles, and a population of 2,415,396 souls, although in direct subordination to the Supreme Government of India, is intricately interlaced with the Bombay British districts, and may, from a geographical point of view, be regarded as forming part of the Bombay Presidency. The Portuguese possessions of Goa, Daman, and Diu, with an aggregate area of about 3,806 square kilometres, and population (1881) of 475,172 souls, are also included within its geographical limits. The capital of the Presidency, the residence of the Governor, and the head-quarters of all the administrative departments, is Bombay City, situated on an island of the same name on the shore of the Arabian Sea, in 18° 55′ 5″ north latitude, and 72° 53′ 55″ east longitude.

**The Capital.**

**Physical aspects.**

*Physical aspects.*—The Presidency of Bombay presents on the map the appearance of an irregular strip of land, stretching along the eastern shore of the Arabian Sea, and extending up the lower portion of the Indus Valley. The continuous coast-line is only broken towards the north by the Gulfs of Cambay and Cutch, between which lies the projecting peninsula of Kathiawar. The sea board is generally rockbound and difficult of access, although it contains many little estuaries forming fair-weather ports for vessels engaged in the coasting trade.

**North of the Narbada.**

Physically, as well as historically, the Bombay Presidency may be roughly divided into two distinct portions, the Narbada (Nerbudda) forming the boundary line. To the north of that river lie the Province of Gujarat, with the peninsulas of Kathiawar and Cutch, and the Province of Sind, to the south the Maratha country, part of the Deccan, the Karnatak, and the Konkan. The former of these tracts is for the most part a low plain of alluvial origin. In Southern Gujarat the valleys of the Tapti and Narbada form sheets of unbroken cultivation. But in Northern Gujarat the soil becomes sandy and the rainfall deficient; cultivation is largely dependent upon either artificial irrigation or the natural humidity caused by the neighbourhood of the ocean. In Sind (beyond the delta on the east), the surface is a

wide expanse of desert, interrupted only by low cliffs or undulating sand heaps. The geological formation is distinct from that of the rest of the Indian Peninsula, consisting of limestone rocks, continuous with those found in Persia and Arabia.

South of the Narbada.

Bombay, south of the Narbada, consists of a level coast strip, rising into an upland country. Mountains furrowed by deep valleys intercept the rain-clouds of the monsoon, and blossom with tropical vegetation. The geological formation is composed of nearly horizontal strata of basalt and similar rocks, which break into steep terraces and hogbacked ridges, and have produced by their decomposition the famous 'black cotton soil,' unsurpassed for its fertility. The Deccan, the Karnatak, and the Konkan are each marked by special features of their own. The Deccan, including Khandesh district, is an elevated plateau behind the Western Ghats. It is drained by several large rivers, along whose banks are tracts of great fertility; but for the rest, the air is dry and the rainfall uncertain. The Karnatak, or country south of the Krishna (Kistna) river, is a plain of lower elevation, and contains wide expanses of black soil under continuous cultivation. The Konkan is the name of the narrow strip of land lying between the base of the Ghats and the sea. As a whole, it is a rugged and difficult country, intersected by numerous creeks, and abounding in isolated peaks and detached ranges of hills. The cultivation consists only of a few rich plots of riceland and groves of cocoanut. The rainfall is excessive.

Districts.

The districts of the Presidency are classified as follows with reference to the natural divisions above described:—

*Sind districts.*—Karachi (Kurrachee), Hyderabad, Shikarpur, Thar and Parkar, and Upper Sind Frontier, forming the Sind division.

*Gujarat districts.*—Ahmedabad, Kaira, Panch-Mahals, Broach, and Surat.

*Konkan districts.*—Thana, Bombay city and island, Kolaba, Ratnagiri, and Kanara.

*Deccan districts.*—Khandesh, Nasik, Ahmednagar, Poona, Sholapur, and Satara.

*Western Karnatak or South Maratha districts.*—Belgaum, Dharwar, and Kaladgi.

Agriculture.

*Agriculture.*—The wide extent and the varied configuration of the Bombay Presidency permit great variations in agriculture. The two most important food-crops are *bájrá* or great millet (*Sorghum vulgare*) and *jowári* or spiked millet (*Holcus spicatus*), which are especially cultivated in the Deccan. Rice is chiefly grown in the

lowlands of the Konkan. Wheat is extensively cultivated in parts of Gujarat and in Sind, and barley is grown in the same localities to a smaller extent. The aboriginal tribes mainly support themselves on inferior cereals, such as *náchaní* (*Eleusine corocana*) and *kodra* (*Paspalum scrobiculatum*), which they plant in patches of cultivation amid the primeval jungle that clothes the hillsides. Pulses and oil-seeds are cultivated to a considerable extent, and among fibres cotton holds by far the chief place. Cotton, oil-seeds and wheat are the chief staples available for exportation.

**Climate.**

*Climate.*—The climate of Bombay differs so greatly in different parts of the Presidency that it is essential, in order to obtain a correct idea of the climatological conditions, to split it up into a number of areas or divisions, in each of which the climate and weather may be considered as approximately homogeneous. The divisions adopted are as follows:—

(1) Sind,
(2) Gujarat,
(3) the West Coast, and
(4) Khandesh and the Deccan.

Even within these areas or divisions there are considerable diversities of climate, but, on the whole, the climatic conditions over each division are approximately similar.

**Sind.**

The great Sind plain is the driest and hottest part of the Bombay Presidency. The aridity, which more or less characterises the whole division, reaches its highest expression in Upper Sind, and, as will be seen from the following table, the relative humidity, as shown by the records of Jacobabad,* is very low throughout the year:—

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % | % | % |
| Humidity | 46 | 39 | 41 | 38 | 36 | 42 | 53 | 58 | 55 | 46 | 45 | 48 |
| | In. | In. | In. | In. | In. | In. | In. | In. | In. | In. | In. | In. |
| Rainfall | 0·2 | 0·2 | 0·3 | 0·2 | 0·1 | 0·1 | 1·4 | 1·4 | 0·3 | ... | 0·1 | 0·1 |

The driest month is May, after which the dampness of the summer monsoon begins to influence the climate and the humidity rises

* Upper Sind Frontier District.

to a maximum in August. The humidity is very steady during October, November, December, and January, and then commences to fall to the annual minimum in May. The rainfall is very light throughout. It amounts to one and-a-half inches in each of the months of July and August, but is unimportant in the other months. Like other dry districts, the vicissitudes of temperature are large. The winter cold is great and the summer heat is proverbial, while the daily range is large, especially in the winter.

The climate of Lower Sind is slightly damper and less extreme than that of Upper Sind. A strong, steady south-west to west-south-west wind blows from April to September and greatly ameliorates the climate, though it brings up very little rain. The driest month is November, when the mean humidity is 56 per cent. and the rainfall only 0·1 inch.

The mean temperature is much more steady than is the case in Upper Sind. The daily range is very small for eight months of the year, but is considerable in the four winter months. The night temperature has never fallen to 41° in the last eleven years, and though on one occasion a temperature of 117·6° has been registered, this was quite exceptional, and 102° to 106° is the highest maximum ordinarily registered in May and June.

In Gujarat, including Kathiawar, the climate is less dry than in Sind and less wet than in the Konkan. There is a rapid change in the climate on advancing inland from the coast. At the coast stations the air is damp with a strong westerly wind and a moderate amount of rain. Gujarat.

Owing to the constant sea breeze, the climate is equable and the daily range of temperature low (14° on the mean of the year), with an actual temperature ranging during the year from 50° to 100°. On proceeding inland these conditions wholly change, and the climate of Deesa (Palanpur State) is comparable with that of Western Rajputana and Upper Sind. The monsoon has, however, a considerably greater effect at Deesa than it has at Jacobabad, and the air is much damper during June, July, August and September, and much drier in the remaining months. The driest month is April, when the mean humidity is only 28 per cent.

There is very little rain from November onward to May, but with the setting in of the monsoon the rainfall increases and is moderate in July and August. The mean temperature is high throughout the year and, except in the monsoon months, the daily range is large. In April, May, and June the mean maximum temperature exceeds 100°, and once, in 1886, the thermometer rose to 118·6°; while in the

winter months the night temperatures are between 50° and 55°, and on one occasion, in 1880, the thermometer fell to 34°.

**Konkan Coast.** The Konkan Coast, extending from the Gulf of Cambay to Karwar, has the dampest and most uniform climate of any part of the Peninsula, and the annual mean temperature is nearly the same throughout the whole distance, *viz.*, 79° or 80°. The whole of the Konkan is almost rainless from the latter part of October to the latter half of May. The rainfall all along the west coast is heavy during the monsoon, which lasts from June to October, but the amount decreases northward: thus the total is 100 inches at Ratnagiri, 73 inches at Bombay, and 42 inches at Surat. The following table gives the monthly averages of rainfall and humidity for Bombay which may be taken as the representative station for this area:—

| | J | F | M | A | M | J | J | A | S | O | N | D | Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Humidity ... | 70 | 69 | 72 | 72 | 70 | 82 | 87 | 87 | 86 | 81 | 71 | 70 | 71 |
| | In. | In. | In. | In. | In. | Ins. | Ins. | Ins. | Ins. | Ins. | In. | In. | In. |
| Rainfall ... | 0·1 | ... | ... | ... | 0·5 | 20·8 | 24·7 | 15·1 | 11·8 | 1·2 | 0·1 | 0·1 | 73·4 |

The rainfall is practically confined to June, July, August, and September, when there are between 20 and 29 wet days each month The mean humidity is lowest in February and highest in July and August. This distribution of humidity holds for all parts of the coast, from Bombay southward, where the mean humidity is comparatively high and equable, but in the north, near Surat, humidity averages 62 per cent. for the whole year and remains between 50 per cent. and 60 per cent. from November to May.

Similarly with temperature. To the north of Bombay the climate of January and February affords cool nights and moderately cool days, but to the south of Bombay there is relatively little temperature change in the seasons. The mean temperature ranges from 74° to 85° and the mean maximum from 82° to 90°. The mean daily range is in no month more than 14° and in four months is less than 10°. The mean annual temperature of Surat is also 80°, but whereas the temperature of Surat in January is 70° and in May 86°, the corresponding temperatures of Bombay are 74° and 85°. The extreme temperatures of

the year (*i.e.*, the highest and lowest readings recorded) show a greater variation; thus, at Surat they are respectively 109° and 48° and at Bombay 95° and 61°. This summary shows that while the main features of the climate for the whole region are great moisture and equable heat, yet in the north these features are less marked than in the south, so that in the neighbourhood of Surat the air is dry, the rainfall light and the range of temperature considerable, relatively to other parts of the coast further to the south.

The Deccan.

A very rapid change of climate occurs in passing from the coast into the inland parts of the Peninsula. After crossing the crest of the ghats, a journey of 30 or 40 miles brings a change from the torrential rainfall of the hills to the dry rolling plains of the Deccan with its precarious and uncertain rainfall. As a general rule, the climate of Khandesh and the greater part of the Deccan is dry, and during the cold weather and spring months almost rainless. During the monsoon this region is swept by a strong, steady west wind, which only occasionally falls off and permits of a light rainfall, but the rainy season is cloudy, cool, and pleasant. The stations of Malegaon, Poona, and Sholapur are representative of this area.

At Malegaon the average annual rainfall is about 25 inches, and of this less than two and-a-half inches are received during the seven months November to May. The heaviest rainfall of the year is in September. The mean annual humidity is only 51 per cent. and the driest month is April, when the humidity is only 28 per cent. Poona lies about 100 miles further to the south and the rainfall on the mean of the year is four inches heavier than Malegaon. The general rainfall conditions are, however, similar and only about two inches of rain falls between November and April. The wettest month is July. In the cold weather months the humidity is as low as at Malegaon, the driest month being March, but in the monsoon the humidity rises to 79 per cent. and the air from June to September is damp. At Sholapur the air is drier than either at Malegaon or Poona. The mean humidity is only 26 per cent. in April and even in the rains averages only between 60 per cent. and 70 per cent. The monsoon blows strongly over the district, but brings comparatively little rain. The rainfall is, however, better distributed throughout the year than in the case of Poona or Malegaon, and the months between November and April receive not infrequent thundershowers.

The mean annual temperature of Malegaon is 76°; that of December, the coolest month, 66°; that of May, the warmest, 88°. The lowest temperatures of the year are ordinarily between 36° and 43°; the highest between 107° and 110°. In the dry months of the year the daily range is about 30° to 35°. Poona has a mean temperature of 78°; that of

December and January is 72° ; that of April 86° : the lowest temperatures of the year have varied between 40° and 50°, and the highest between 100° and 110°, and in the dry months of the year the daily range is 30° to 34°. The mean annual temperature of Sholapur is 79° ; that of December, the coolest month, 70° ; and that of May, the hottest month, 89°: the lowest temperatures of the year have varied between 42° and 49° and the highest between 108° and 112°. The mean daily range in the dry months is about 32°.

**General statistics.**

The following table shows the mean temperature, humidity and rainfall values for the different regions of the Bombay Presidency :—

| Month. | Sind. | | | | Gujarat and Kathiawar. | | | | Konkan. | | | | Khandesh and Deccan. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean temperature. | Mean daily range. | Average rainfall. | Average humidity. | Mean temperature. | Mean daily range. | Average rainfall. | Average humidity. | Mean temperature. | Mean daily range. | Average rainfall. | Average humidity. | Mean temperature. | Mean daily range. | Average rainfall. | Average humidity. |
| | ° | ° | in. | % | ° | ° | in. | % | ° | ° | in. | % | ° | ° | in. | % |
| January ... | 61 | 27 | 0·4 | 52 | 69 | 27 | 0·1 | 46 | 74 | 14 | 0·1 | 70 | 71 | 33 | 0·1 | 41 |
| February ... | 65 | 26 | 0·3 | 49 | 71 | 26 | 0·1 | 45 | 75 | 13 | 0 | 69 | 75 | 34 | 0·1 | 35 |
| March ... | 75 | 25 | 0·3 | 54 | 79 | 26 | 0·1 | 52 | 79 | 11 | 0 | 73 | 82 | 33 | 0·2 | 30 |
| April ... | 82 | 24 | 0·2 | 53 | 84 | 23 | 0·1 | 50 | 82 | 11 | 0 | 75 | 86 | 32 | 0·5 | 28 |
| May ... | 88 | 23 | 0·1 | 55 | 88 | 18 | 0·1 | 60 | 85 | 10 | 0·5 | 75 | 87 | 29 | 1·2 | 38 |
| June ... | 92 | 20 | 0·2 | 58 | 87 | 13 | 4·3 | 69 | 83 | 8 | 20·8 | 82 | 81 | 20 | 5·1 | 63 |
| July ... | 89 | 17 | 2·3 | 66 | 82 | 9 | 8·6 | 81 | 81 | 8 | 24·7 | 87 | 78 | 15 | 5·0 | 72 |
| August ... | 87 | 16 | 1·6 | 68 | 81 | 9 | 5·3 | 81 | 80 | 7 | 15·1 | 87 | 77 | 15 | 4·8 | 72 |
| September ... | 85 | 18 | 0·6 | 66 | 81 | 13 | 2·6 | 77 | 80 | 8 | 10·8 | 86 | 76 | 16 | 6·1 | 73 |
| October ... | 79 | 26 | 0·1 | 56 | 81 | 22 | 1·0 | 56 | 81 | 11 | 1·8 | 81 | 77 | 22 | 3·4 | 58 |
| November ... | 69 | 29 | 0·1 | 51 | 76 | 26 | 0·5 | 45 | 80 | 13 | 0·5 | 71 | 73 | 27 | 0·6 | 49 |
| December ... | 63 | 28 | 0·2 | 53 | 71 | 27 | 0·1 | 45 | 76 | 14 | 0·1 | 70 | 69 | 29 | 0·4 | 46 |
| Year ... | 78 | 23 | 6·2 | 57 | 79 | 20 | 22·9 | 59 | 80 | 11 | 74·4 | 77 | 78 | 25 | 27·5 | 50 |

**Inhabitants.**

***Inhabitants.***—The population of the Presidency proper consists mainly of Hindus, divided into the two main ethnical and historical

divisions of Gujarat is, or inhabitants of Gujarat, and Marathas, occupying broadly the southern portion of the Presidency. The inhabitants of Gujarat include a somewhat larger Muhammadan element than is found in the Maratha country. In addition there is the Dravidian element represented principally by the Konkanis and Kanarese of the coast. The people of the outlying province of Sind are almost all Muhammadans by religion; their country was the earliest field of Mussulman conquest in India.

**Executive Administration.**

*Executive Administration.*—The government of the Presidency of Bombay is administered by a Governor and his council. This body is the chief executive and legislative authority of the Presidency and consists of the Governor as President, and two members of the Indian Civil Service. The various departments of the administration are portioned out among the Members of Council. There is also a Legislative Council composed of the Governor and his Executive Council above described, together with four to eight other members nominated by the Governor. Not less than a certain proportion of these additional Legislative Members of the Council must be non-officials, with a view to the representation of the European and Native communities. For administrative purposes the Presidency is divided into four divisions, called the Northern (seven districts), Central (seven districts, including Bombay city and island), and Southern (five districts), in Bombay Proper, and the Sind division of five districts; these divisions embrace (including Bombay city and island) 24 districts, each division being placed under the control and superintendence of a Commissioner. The district is the actual unit of administration for both fiscal and judicial purposes. The regulation districts of Bombay number 17, each under the control of a Magistrate-Collector, who must be a member of the Indian Civil Service. The province of Sind and the Panch-Mahals in Gujarat form seven non-regulation districts, under officers who may be either military officers, members of the Indian Civil Service, or other officers. The city of Bombay is regarded for many purposes as forming a district by itself. Each district is on the average divided into 10 talukas or sub-divisions, each of which again contains about 100 government villages, or villages of which the revenue has not been alienated by the State. Every village is, for fiscal and police, as well as social purposes, complete by itself. It has its regular complement of officials, who are usually hereditary, and are remunerated by grants of land held revenue-free. The more important of these officials are the *patel* or headman: the *talati* or *kulkarni*, who is the clerk and accountant; the *mhar*, who is a kind of a beadle; and the watchman. Over each taluk or sub-division is set a government officer termed a *Mamlatdar*; and on an average about three talukas are

placed in charge of an Assistant or Deputy Collector. General supervision is exercised by the Commissioners, as above stated, who are three for the regulation districts and one for Sind.

The political relations between the Government and the Native States in connection with the Bombay Presidency are maintained by the presence of an Agent or representative at the principal Native Courts. The position and duty of the Agent varies very considerably in the different States, being governed by the terms of the original treaties, or by recent sanads or patents. In some instances, as in Cutch, his power is confined to the giving of advice, and to the exercise of a general surveillance. In other cases the Agent is invested with an actual share in the administration; while States whose rulers are minors, and the number of these is always large, are directly managed by Government officers. The characteristic feature of the Bombay Native States is the excessive number of petty principalities, such as those of the Rajputs and Bhil chieftains. The peninsula of Kathiawar alone contains no less than 187 separate States.

## General Remarks on the Plague Epidemic.

**Statement of seizures and deaths.**

The following is a statement of the reported plague seizures and deaths in the Bombay Presidency and Goa from the beginning of the outbreak up to the 27th August :—

| Locality. | Population according to the census of 1891. | Number of plague seizures. | Number of seizures per 100,000 persons. | Number of plague deaths. | Number of deaths per 100,000 persons. |
|---|---|---|---|---|---|
| **BOMBAY PRESIDENCY PROPER.** | | | | | |
| Bombay City ... ... | 821,764 | *12,795 | 1,557 | *10,813 | 1,316 |
| Mandvi Town (Cutch State) ... | 38,185 | 4,359 | 11,424 | 3,853 | 10,098 |
| Poona City ... ... ... | 161,360 | 2,543 | 1,576 | 1,819 | 1,127 |
| Thana District ... ... | 904,868 | 4,974 | 550 | 3,857 | 426 |
| Janjira State ... ... | 81,360 | 257 | 351 | 164 | 201 |
| Surat District ... ... | 649,989 | 2,154 | 331 | 1,632 | 251 |
| Kolaba District ... ... | 509,584 | 1,329 | 261 | 1,172 | 230 |
| Navsari Division (Baroda State) ... | 316,433 | 563 | 176 | 456 | 143 |
| Cutch State ... ... ... | 520,266 | 840 | 161 | 630 | 123 |
| Poona District ... ... | 908,410 | 1,189 | 131 | 826 | 91 |
| Satara District ... ... | 1,225,979 | 1,179 | 96 | 844 | 69 |
| Ratnagiri District ... ... | 1,103,929 | 377 | 34 | 316 | 29 |
| Palanpur State ... ... | 645,560 | 167 | 26 | 104 | 16 |
| Ahmedabad District ... ... | 921,712 | 163 | 18 | 96 | 10 |
| Nasik District ... ... | 843,582 | 136 | 16 | 98 | 12 |
| Goa ... ... ... | †420,868 | 62 | 15 | 16 | 4 |
| Kolhapur State ... ... | 913,131 | 127 | 14 | 100 | 11 |
| Savantvadi State ... ... | 192,948 | 25 | 13 | 24 | 12 |
| Kathiawar, including Amreli Division (Baroda State). | 2,732,592 | 280 | 10 | 181 | 6 |
| Ahmednagar District ... ... | 888,755 | 54 | 6 | 37 | 4 |
| Broach District ... ... | 341,170 | 19 | 6 | 12 | 4 |
| Sholapur District ... ... | 780,689 | 29 | 4 | 25 | 3 |
| Kadi Division (Baroda State) ... | 1,008,742 | 30 | 3 | 24 | 2 |
| Khandesh ... ... ... | 1,400,851 | 33 | 2 | 18 | 1 |
| Baroda Division (Baroda State) ... | 817,023 | 12 | 1 | 12 | 1 |
| Kaira District ... ... | 871,589 | 22 | 2 | 18 | 2 |
| Bhor State ... ... ... | 155,699 | 2 | 1 | 2 | 1 |
| Mahikantha State ... ... | 581,598 | 3 | 1 | 1 | ·17 |
| Kanara District ... ... | 446,351 | 1 | ·22 | 1 | ·22 |
| Belgaum District ... ... | 1,013,261 | 2 | ·19 | 1 | ·09 |
| Dharwar District ... ... | 1,051,314 | 2 | ·19 | 1 | ·09 |
| TOTAL FOR THE BOMBAY PRESIDENCY PROPER. | ... | 33,755 | ... | 27,163 | ... |
| **SIND.** | | | | | |
| Karachi City ... ... | 105,199 | 4,181 | 3,974 | 3,398 | 3,230 |
| Shikarpur District ... ... | 915,437 | 696 | 109 | 699 | 76 |
| Hyderabad District ... ... | 915,240 | 641 | 70 | 499 | 54 |
| Karachi District ... ... | 459,081 | 238 | 52 | 178 | 39 |
| Upper Sind Frontier District ... | 134,548 | 4 | 2 | 3 | 2 |
| Thar and Parkar District ... | 208,203 | 3 | 1 | 2 | 1 |
| TOTAL FOR SIND ... | ... | 6,063 | ... | 4,779 | ... |
| GRAND TOTAL ... | ... | 39,818 | ... | 31,942 | ... |

* These figures are the sums of the reported seizures and deaths. It is, however, known that especially during the early period of the epidemic the reporting of cases was not complete and that the actual number of cases was much greater than the number reported. During the period from the week ending the 1st September 1896 to the week ending the 25th April 1897 inclusive the excess of the total mortality of the city over that of the corresponding period of the previous five years was 20,828. After that period the reporting was more accurate and the general mortality of the city first sank below the normal and then rose above it, owing to an outbreak of cholera and other causes. Adding to the figure 20,828 the reported plague deaths from the 21st April up to the 27th August (inclusive), we obtain a total of 21,614, and this approximates more nearly to the actual number of deaths from plague. It gives a proportion of above 2,630 deaths per 100,000 of the population according to the last census. The accuracy of the calculation is to some extent vitiated by the fact that during the worst period of the epidemic the population was largely diminished by emigration. The Municipal Commissioner of Bombay made a calculation based on total mortality and the estimated population of the city from month to month which gives a total number of 25,828 deaths from plague up to the end of July.

† Population according to census of 1881.

**Total mortality.**

This statement gives a total mortality of 31,942. It is certain that the actual mortality must have been considerably higher than this figure. It is explained in the footnote of the statement that the deaths from plague in the City of Bombay were probably not less than from twenty to twenty-five thousand, whilst the number of reported deaths was under eleven thousand. In many smaller places the registration was probably more accurate, but it is known that in some important plague centres, such as Poona and Mandvi, the reporting at the outset was very incomplete, and everywhere many cases must have escaped detection. It is very difficult to express a decided opinion as to what the total mortality has been, but it seems probable that up to the end of August the number of deaths from plague must have amounted to over fifty thousand.

**Division of the subject.**

The course of the epidemic will now be described, first, in the City of Bombay; secondly, in the Bombay Presidency proper; and lastly, in Sind.

## Bombay City.

**Description of Bombay City.**

The City of Bombay is situated on an island lying off the Konkan Coast and is connected by causeways, over which run the Great Indian Peninsula and Bombay, Baroda and Central India lines of railway with the larger Island of Salsette and so continuously with the mainland. The general features of the city and island will be seen from the map given in Volume IV (page 7). The city is divided into seven wards—

| | |
|---|---|
| Fort. | Girgaum. |
| Mandvi. | Byculla. |
| Bhuleshwar. | Parel. |
| Mahim. | |

The quarter known as the Fort lies in the north of the Fort Ward, on a slightly raised strip of land between Back Bay and the harbour. It is the original nucleus round which the town grew up, and is chiefly occupied by public buildings and commercial offices. The most conspicuous line of public buildings is in the Esplanade quarter facing Back Bay.

The main portion of the native town lies in the Mandvi and Bhuleshwar Wards, the north-east portion of the Girgaum Ward and the

southern portion of the Byculla Ward. The north of the island composing the Parel and Mahim Wards and the northern part of the Byculla Ward is comparatively sparsely populated. The quarters of the European residents are chiefly situated on the two spurs at the south of the island, Malabar Hill and Colaba. Notwithstanding the magnificent aspect of the city with its almost unrivalled situation and many handsome buildings, the conditions of life in the native town are unhealthy and to a high degree favourable to the growth of a disease like plague. Surgeon-Major-General Cleghorn, Sanitary Commissioner with the Government of India, gave the following description of the condition of the native dwellings when the epidemic first broke out :—

Insanitary tenements.

"The *chauls* or tenements may run up to seven stories, and the unit of construction is a long corridor with rooms opening on either side. In the corridor, either at one end or in the centre, is situated a water tap with bathing platform, and alongside it a latrine with two or three seats. The whole tenement is built up of a congeries of these corridors and rooms, and contains from 500 to 1,000 individuals. The only space between each tenement is a gully sufficiently wide to admit a sweeper. In most of the corridors and rooms, either from the absence of openings or from the obstruction of the existing ones, there is absolutely no light admitted, and consequently no ventilation. The Health Officer informed me that he estimated that 70 per cent. of the population live in such houses. The corridors, before being taken in hand by the Health Department, were the repositories of filth of all kinds, and it is surprising that the mortality under such conditions has been so small."

Population.

The following statement shows the population of the different wards according to the census of 1891 :—

| | |
|---|---|
| Fort ... ... ... ... ... | 64,819 |
| Mandvi ... ... ... ... | 152,277 |
| Bhuleshwar ... ... ... ... | 206,372 |
| Girgaum ... ... ... ... | 93,305 |
| Byculla ... ... ... ... | 180,425 |
| Parel ... ... ... ... | 54,404 |
| Mahim ... ... ... ... | 43,998 |
| TOTAL ... | 795,600 |

Hardly any city in the world presents a greater variety of national types than Bombay. The Muhammadans and Hindus of course predominate in numbers, and the Hindus are considerably more numerous than the Muhammadans.

**Commencement of the outbreak.**

No certain information has been gathered as to when the outbreak in the City of Bombay commenced, what was the immediate cause of the outbreak, or even in what part of the city the first cases occurred.

**First public announcement.**

Dr. Viegas, a medical practitioner of Bombay, was the first person to publicly announce that he had detected the existence of cases of bubonic plague; and the first official intimation was received by the Municipal Commissioner on the 23rd September. On the 29th September the Government of Bombay telegraphed to the Government of India that the Surgeon General reported having seen about twenty cases of a mild type of bubonic plague in Bombay. On the same day the Government of India directed M. Haffkine to go to Bombay at once and make a thorough bacteriological enquiry. On the 13th of October M. Haffkine telegraphed that bacteriological examination had demonstrated beyond doubt the identity of the disease.

**M. Haffkine's investigation.**

**Diagnosis confirmed.**

**Failure to discover the disease.**

**Early suspicious cases.**

Several circumstances point to plague having prevailed in Bombay for some time before its existence was recognised. In August cases of fever with glandular swellings had been attended by several medical practitioners, cases of fever accompanied by pneumonia had been reported to the Executive Health Officer, and a death was actually registered on the 31st August as due to bubonic fever. These circumstances failed to arouse an alarm of plague, as a type of fever with glandular swellings has, it is said, been for years known in Bombay. Again, it is stated by Mr. Snow, the Municipal Commissioner, that "when plague broke out, several native practitioners of the first standing acknowledged that from the end of the hot weather in May onwards they had come across several cases of peculiar fever which entirely puzzled them and usually ended fatally. It does not, however, appear that the bubonic swellings in such cases were apparent in a marked degree, and little further thought appears to have been given to the matter, which is no wonder considering the various obscure form of plague noticed in the epidemic."

**High mortality in the city.**

The extraordinarily high rate of mortality which prevailed in the city from the latter part of August onwards also pointed to the existence of some unusual phenomenon. The following statement compares the total mortality from different causes in the City of Bombay during the last week in August and during the month

of September 1896, with the average mortality during the corresponding periods of the preceding five years:—

| Period (week ending) | Cholera. | | Small-pox. | | Fevers. | | Bowel-complaints. | | All other diseases. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1896. | Average for corresponding period of previous five years. | 1896. | Average for corresponding period of previous five years. | 1896. | Average for corresponding period of previous five years. | 1896. | Average for corresponding period of previous five years. | 1896. | Average for corresponding period of previous five years. | 1896. | Average for corresponding period of previous five years. |
| 1st September | 26 | 8 | 1 | 2 | 165 | 127 | 94 | 53 | 345 | 318 | 629 | 508 |
| 8th September | 20 | 5 | 4 | 2 | 140 | 125 | 57 | 47 | 342 | 312 | 563 | 494 |
| 15th September | 9 | 5 | *Nil.* | 1 | 137 | 107 | 49 | 41 | 354 | 335 | 550 | 459 |
| 22nd September | 5 | 12 | 3 | 1 | 174 | 116 | 54 | 40 | 378 | 309 | 613 | 478 |
| 29th September | 3 | 11 | 2 | ... | 255 | 122 | 42 | 31 | 369 | 327 | 671 | 492 |

The excess occurred chiefly under the heads of "fevers" and "all other diseases;" the latter head included an unusual number of deaths from diseases of the respiratory organs. Both fevers and disorders of the lungs are diseases for which the Indian plague may easily be mistaken. Brigade-Surgeon-Lieutenant-Colonel Weir, the Health Officer of the Municipality, has stated that it should not be assumed that this unusual mortality was due to plague. He points out the remarkable circumstance that the increase in mortality was largely confined to persons not born in Bombay, and he suggests that an influx of strangers due to a large religious assemblage held at Nasik, near Bombay, may have had an important influence on the general mortality. But allowing for the possible contemporaneous existence of other causes, the unusual mortality coupled with the other evidence must still point to the probability of numerous cases of undetected plague.

That once plague was discovered it was found to be widely diffused through the city is additional evidence of a very important description. It has been stated that the first public declaration of the existence of plague was made on the 23rd September. The municipal returns record the occurrence of 145 cases of plague during the week ending the 2nd October: 89 in the Mandvi quarter and

*the remainder spread over twenty-two of the thirty-two quarters into which the city is divided.* The actual number of cases which occurred during the week was, it is known, much greater than the number reported. Bearing in mind the slow rate at which the infection of plague spreads during the early period of an epidemic, it is certain that the disease must have been in existence for a considerable time before the cases could have become so numerous and so widely diffused.

**Cause of the outbreak.**

The immediate cause of the outbreak must remain a matter of conjecture. It would seem probable that the infection was introduced by sea, since it is most unlikely that the disease could have been carried overland from the small endemic centre in the Himalayas, or that it could have been introduced from beyond the border by any land route. It has been seen that an endemic plague centre exists on either side of the Indian Peninsula—to the west in Mesopotamia and to the east in China. In so far as is known, there was no unusual prevalence of plague in Mesopotamia at the time of the outbreak in Bombay. But on the west the second or 1896 outbreak in Hong-kong had not died out when Bombay became infected. The probability would therefore seem to point to China rather than to Mesopotamia as the source whence the infection was derived. In connection with this question it is interesting to note that Staff Surgeon Wilm, whilst eulogising the general arrangements made in Hong-kong to stamp out the epidemic, remarked that too little attention was paid to the water-borne traffic. And in India quarantine was not imposed against Hong-kong during the 1896 epidemic at that place, although it was imposed during the more important epidemic of 1894 and withdrawn when that epidemic ceased. Intimation of the recrudescence in 1896 was not sent to the Government of India, and it would appear that in Egypt also quarantine was not imposed. It is therefore quite possible that undetected cases of plague may have arrived from Hong-kong.

**Abnormal climatic conditions.**

The outbreak of plague in Bombay occurred at a time of unusual climatic conditions. The early cessation of the monsoon of 1896 is notorious in connection with the widespread famine which resulted in India. Dr. Weir has given the following account of the phenomenon as it affected the City of Bombay:—

"The mean annual temperature of the year was 80·7, the second highest on record in the last 51 years. The total fall of rain amounted to 87·6 inches, being 15 inches above the average. But the distribution of the rainfall was abnormal, for, instead of being distributed over four months, it was distributed over a much shorter period—a

ittle over six weeks—and, instead of being succeeded by the great atmospheric disturbances designated elephantas, the monsoon currents ceased in less than two months, and the thunderstorms which we look forward to as announcing the end of the rainy season were absent. The rainfall in June was 28 inches, or 8 inches above the average, and the rainfall in July amounted to 36·4 or 11·7 inches over the average. In August the rainfall amounted to 20·8 inches, giving an excess of 7½ inches over the average. The rainfall, therefore, was abnormal in its duration and in its distribution. It must be remembered that the sanitary effects of the annual rainfall on the public health are as marked as are the aberrations of the rainfall on agriculture. The heavy rainfall in 1896, as we remember, flooded with sewage the low-lying portions of the city, through which the polluted streams rushed in swirling currents, leaving banks of mud and sludge behind to ferment or slowly dry; and, moreover, the sewage flowed from the sewers on to the streets after each heavy downpour and rushed up the traps and flowed on to the low-lying ground. Unfortunately, in the beginning of the monsoon, a serious obstruction occurred on the Worli foreshore, in the outfall channel of the sewage. The stoppage took place during a great storm, and it was impossible to send men down in the heavy seas to remove the obstruction. Although the monsoon practically ceased in the middle of August, the shady sides of the streets in crowded portions of the city remained damp long afterwards. I find a note in the last week of August drawing attention to it. In September only 1·6 inches of rain fell, being 10 inches lower than the average. This was the most abnormal month of an abnormal year yet recorded (even in the famine years of 1876-77, the September rainfall was not less than 4 inches); and an abnormal September was followed by an abnormal October, dry and warm."

Outbreak in Mandvi.

The disease was first discovered in the Mandvi quarter of the ward of the same name, in the heart of the crowded portion of the city where local conditions greatly favoured its growth. The subsequent progress of the epidemic is illustrated by the statements given in Appendix III. The statements show—

Statistics, charts, and maps.

(*a*) Total reported plague seizures and deaths in the city, week by week.

(*b*) Total weekly mortality of the city compared with the average weekly mortality of the corresponding period of the preceding five years.

(*c*) Total reported plague seizures in each quarter and ward.

(*d*) Reported plague seizures in the different wards of the city, week by week.

(*e*) Reported plague seizures in the different quarters into which the wards are subdivided, week by week.

The charts on pages 21 to 23 of Volume IV illustrate the course of the plague in the city and in its different wards. On page 6 of Volume IV is a map showing the incidence of the mortality in the different quarters of the city.

**Inaccuracy in reporting.**

In examining the statements it has to be remembered that they probably do not show much more than one-half of the actual number of cases, and that the reporting was much less accurate in the beginning than at the end of the period. Whilst therefore the statements are of great use in illustrating the comparative virulence of the disease in the different quarters, and the general course of its rise and fall, they must not be taken as furnishing anything approaching to an exact statement of the cases that occurred.

**Monthly seizures.**

The following was the total number of seizures reported month by month :—

| | |
|---|---|
| October 1896 ... ... ... ... | 406 |
| November ,, ... ... ... ... | 339 |
| December ,, ... ... ... ... | 1,664 |
| January 1897 ... ... ... ... | 2,374 |
| February ,, ... ... ... ... | 3,172 |
| March ,, ... ... ... ... | 2,405 |
| April ,, ... ... ... ... | 1,418 |
| May ,, ... ... ... ... | 448 |
| June | 186 |
| July | 62 |
| August | 124 |

**General course of the epidemic.**

In October 1896, the number of reported seizures fluctuated considerably, but the epidemic did not show any tendency to increase. In the first-half of November there was also no increase and the hope was encouraged that the epidemic would soon die out. But in the second-half of November the increase began. In the beginning of December there was a large rise which continued progressively until the end of the month. Throughout January the high figure was maintained, and a further rise occurred at the end of that month. February saw the height of the epidemic, the following being the figures for the four weeks of the month :—

| Period. | Reported seizures. | Excess of total mortality from all causes over corresponding figures for preceding five years. |
|---|---|---|
| First week | 717 | 1,375 |
| Second ,, | 870 | 1,166 |
| Third ,, | 822 | 1,116 |
| Fourth ,, | 763 | 945 |

During March the disease began rapidly to decline, and the epidemic waned steadily throughout April, May, June and the first-half of July. The period from the 1st to the 15th July showed a total of only 15 isolated cases. From the middle of July began the recrudescence.

Those among the population who could leave the city endeavoured to save themselves by flight. In Mr. Snow's report the following estimate is given of the exodus :— Flight of the population.

| | | |
|---|---|---|
| In October 1896 ... ... ... | about | 20,000 |
| In November and December 1896 ... | ,, | 171,500 |
| In January 1897 ... ... ... | ,, | 187,400 |
| In February 1897 ... ... ... | ,, | 19,100 |
| TOTAL ... | ,, | 398,000 |

Mr. Snow gives the following account of the exodus :—

"The outward flow began in October, and the smallness of its dimensions up to the end of that month may be ascribed to the fact that the disease was for a long time confined principally to one locality. The exodus increased through November and December, and reached its highest point in January, after which it rapidly subsided, and during March and April there was a steady stream back to Bombay. The appearance of plague in the various cities of refuge to which the people fled had probably great influence in checking the emigration from Bombay and the horrible mortality in some of those places must have gone far to persuade them of the advisability of returning to their ordinary avocations.

"The population of Bombay at the census of 1891 was 821,764, and, taking into consideration the rate of increase between 1881 and 1891, we may assume that in 1896 the total number of persons in Bombay was about 846,000. Taking the exodus at, roughly, 4 lakhs, we shall not be far wrong in estimating that at the beginning of February it was reduced to something like 4½ lakhs.

"While the panic was at its height and the exodus in full flow, the scenes at the railway stations were striking—a motley crowd of natives of every caste and creed pressing and shouting for tickets, and then, as the train steamed in, a hurrying anxious throng, old and young alike, tottering under enormous bundles of household goods. As special after special left the stations, the relics of the disappointed crowd sooner than miss the next opportunity would quietly settle down to sleep on the platforms. The busy scenes at the station stood out in marked contrast to the quietness of Bombay; whole streets of shops were closed, business was paralysed and the desolate emptiness of

thoroughfares ordinarily teeming with life was most remarkable and continued throughout the months of December and January, when the population had been reduced to its lowest figure."

**Course of the epidemic in different wards.**

Until the end of September the disease appears to have been mainly confined to the Mandvi quarter of the ward of the same name, but from the beginning of October cases were reported from many parts of the city. Speaking generally, the plague travelled from east to west and then north, throwing out branches to the south. In the Mandvi Ward itself the disease persisted with fluctuations until the beginning of May, when it rapidly declined. The worst periods appear to have been the beginning of October and the month of April. In Bhuleshwar the cases began to increase in number at the end of November, and the disease was virulent throughout December, January and the first-half of February, a sudden drop then occurred in the number of cases, after which the decline of the epidemic was gradual and steady. In the Fort Ward the main period of the epidemic was from the beginning of December to the end of April, January and February being the worst months. The disease was never virulent in this ward. The end of December to the beginning of April was the main period of the epidemic in Girgaum; it was specially virulent in February. In Byculla the epidemic was strongly marked from the middle of December to the middle of April, and the number of cases was extremely high during the second-half of December and the whole of January, February and March. The epidemics in the Parel and Mahim Wards in the north of the island were almost synchronous; they were extremely violent, but also short lived. The main period was from the end of January to the middle of April. From this point the decline was unusually rapid, and before the end of May the disease had practically died out in both wards.

**Manner in which the infection spread.**

It was noticed that the first onset of the disease was rarely rapid in any locality. Isolated, imported and, perhaps, endemic cases occurred from time to time, followed by one or more small groups of endemic cases. Then the disease having obtained a footing in the locality began to spread and soon increased with rapidity and virulence until the place became thoroughly infected. It was also noticed that infection appeared to spread from house to house, neighbouring houses forming groups in which many cases occurred. The infection was hardly ever found at all evenly distributed over the locality.

**Comparison of the intensity of the epidemic in different wards.**

Comparing the wards one with another, it will be seen that in comparison with its population the Mahim Ward in the north of the island suffered most, the number of reported seizures amounting to 38 per

one thousand of the population according to the 1891 census. Parel, the other ward in the north of the island, also suffered severely, the number of seizures per one thousand of the population being 18. Byculla Ward was next worst to Mahim, the per thousand figure being 22; the figures for the other wards were—

| | | | | | |
|---|---|---|---|---|---|
| Girgaum | ... | ... | ... | ... | 16 |
| Fort | ... | ... | ... | ... | 13 |
| Mandvi | ... | ... | ... | ... | 11 |
| Bhuleshwar | ... | ... | ... | ... | 10 |

It is remarkable that the wards forming the main body of the city show the smallest number of reported seizures in proportion to the number of inhabitants. The two wards in the north of the island owe their heavy mortality to virulent outbreaks in small and insanitary villages and suburbs. The extensive flight of the inhabitants also interferes to some extent with the deduction to be drawn from the figures. The population figures used in the statements are taken from the census return of 1891, but the actual population after the flight had set in was, it has been seen, reduced to a far lower figure, and the flight may have been more extensive in some localities than in others. The wealthier inhabitants of the city would be able to leave much more easily than the poor fishermen living in the villages in the north of the island.

**Localities chief affected.**

The incidence of the disease varied greatly in different quarters of the same ward. In Mahim Ward the figures were—

Mahim quarter ... 61 seizures per 1,000 of the population.
Worli „ ... 21 „ „ „

The exceedingly high totals in this ward were due to virulent outbreaks in dirty and insanitary fishing villages. An account of these outbreaks and the measures taken to suppress them is given in Chapter VII. In Parel Ward the number of seizures per one thousand of the population in the different quarters was as follows:—

| | | | | | | |
|---|---|---|---|---|---|---|
| Siwri | ... | ... | ... | ... | ... | 31 |
| Sion | ... | ... | ... | ... | ... | 20 |
| Parel | ... | ... | ... | ... | ... | 14 |

Again, an insanitary fishing village (Siwri) shows the largest number of cases.

In Byculla the figures were—

| | | | | | |
|---|---|---|---|---|---|
| Mazagon ... | ... | ... | ... | ... | 29 |
| Kamathipura | ... | ... | ... | ... | 25 |
| First Nagpada | ... | ... | ... | ... | 24 |
| Tardeo ... | ... | ... | ... | ... | 23 |
| Byculla ... | ... | ... | ... | ... | 21 |
| Tarwadi ... | ... | ... | ... | ... | 18 |
| Second Nagpada | ... | ... | ... | ... | 19 |

Mazagon includes a portion of the docks ; Kamathipura and Nagpada form the north part of the main body of the native town.

In Girgaum Ward the disease was severest in Mahalakshmi (32 per mille), and next in Walkeshwar (21 per mille) in which Malabar Hill is situated.

In the Mandvi and Bhuleshwar Wards (which form the greater portion of the main body of the town), the incidence of the disease, according to the figures based on reported seizures and the population of 1891, was much lower. The per thousand figures vary from 21 in Mandvi quarter to 4 in Chakla.

In the Fort Ward the total number of cases was small, but the quarter of Upper Colaba shows a per thousand figure of 24.

## The Bombay Presidency Proper.

**Statistics, charts, and maps.**

The extent and course of the first period of the epidemic in the Bombay Presidency proper is illustrated by the following statements in Appendix III :—

(*a*) Weekly statement of reported seizures in districts and Native States.

(*b*) Weekly statement showing both seizures and deaths.

(*c*) Weekly statement distinguishing between imported and indigenous cases.

(*d*) Weekly statements showing the principal localities in districts and Native States in which the disease was endemic.

The charts in Volume IV, pages 24 and 25, illustrate the course of the disease in the districts and Native States where the epidemic was most severe. The maps on pages 3 to 5 of Volume IV illustrate the incidence of the epidemic, and show the principal localities in which the disease prevailed. The statements, charts, and maps cover the period from the beginning of the outbreak up to the end of August 1897, that is to say, up to the time when the recrudescence had begun to gain ground.

**Geographical distribution of the disease.**

Geographically the epidemic may be divided into four divisions. The first and most important is, that which extended along the Konkan Coast from the Surat to the Ratnagiri districts, and includes the town and island of Bombay, the districts of Surat, Thana and Kolaba, the Navsari division of the Baroda State, the Janjira State, the small Portuguese possession of Daman and the northern portion of the Ratnagiri district. The second group of infected localities forms a line running north and south along the

west and centre of the Deccan districts. It includes the districts of Nasik, Poona, Satara, Ahmednagar, and the northern portion of the Kolhapur State. Khandesh and the eastern portion of the Deccan districts escaped altogether or show only very few indigenous cases. The southern districts of Sholapur, Kaladgi, Dharwar, Belgaum, and Kanara, the southern portion of the Kolhapur State, and the Portuguese possession of Goa remained practically free from plague. The third division extends over the whole of Gujarat, north of Surat district, excluding Cutch, which forms the fourth division. Indigenous cases occurred at a number of places scattered widely over Gujarat, the only serious outbreak was at Palanpur. There was a very virulent epidemic in Cutch.

The Konkan Coast the chief seat of the epidemic.

Apart from Poona and Cutch, the first division is the only one in which the districts show a number of reported cases in excess of one per one thousand of the population according to the census of 1891. The figures are—

| | Number of reported cases per 100,000 of the population. |
|---|---|
| Thana district ... ... ... | 550 |
| Janjira State ... ... ... | 351 |
| Surat district ... ... ... | 331 |
| Kolaba district ... ... ... | 261 |
| Navsari division (Baroda territory) ... | 176 |

Thana.

In Thana district indigenous cases occurred in 60 places, and more than 100 such cases in 11 places. The disease was worst at Bandra, Bhiwindi, Bassein, and Kurla, all near the city of Bombay. In the Surat district also indigenous cases occurred in 53 places. The epidemic also was worst at Bulsar on the sea coast, and was also bad at Mugod and Rander. In the Kolaba district the disease was worst at Revdanda and Alibag. It spread to 29 other places. This division of the epidemic includes also a virulent outbreak at the small Portuguese possession of Daman between the Thana and Surat districts. The plague was worst in the portion of the territory known as Little Daman, and it is said that here more than one-third of the population perished.

Kolaba.

Daman.

Poona City.

In the second division the city of Poona was the principal seat of the disease. Here the reported number of cases up to the 27th August amounted to 2,543, or 16 per thousand of the population, and the actual number of cases is known to have been much greater. The late Mr. Rand, who was in charge of plague operations in the city, estimated on the basis of total mortality from all causes that the number of deaths from plague were certainly not less than 2,900 in the city itself (excluding the cantonment and suburbs), giving

**Poona district.** a death-rate of 24 per thousand. In Poona district the number of reported cases amounted to 1,186. The disease was worst in Kirkee cantonment and the small station of Lonavla, and it extended to ten other places. In Satara district very few cases occurred during the first period of the epidemic. The cases in this district belong to the period of the recrudescence and will be noticed later on. In Nasik and Ahmednagar districts there were few indigenous cases.

**Satar.**

**Palanpur.** In the third division the outbreak at Palanpur was the most important incident. Here there were 167 indigenous cases mainly at Palanpur itself. The number of indigenous cases in Ahmedabad, Baroda territory, and other places in the third division was small.

**Mandvi.** In Cutch (the fourth division) the outbreak began with an epidemic at Mandvi, which was one of the worst that occurred. The number of reported indigenous cases was 4,359, or more than 11 per cent. of the population, and it is known that large numbers had been attacked before the existence of the epidemic was brought to the notice of the authorities. From Mandvi the disease spread to a number of villages in the State, and for several months caused considerable mortality.

**Course of the epidemic.** In the months of October and November, 1896, isolated imported cases were detected from time to time at different places in the presidency, but it was not until December that the epidemic began to show a marked tendency to spread. The imported cases were at first most numerous in the Ahmedabad district, but here they failed to occasion any diffusion of the malady. Only 27 indigenous cases were reported in all: they occurred between the middle of February and the end of the first week in May. Satara district in the Deccan was one of the localities in which indigenous cases appeared at an early stage, but here also the infection did not spread. Only 88 indigenous cases were reported during the first period of the epidemic, mostly in November and February. It is remarkable that Satara should have escaped so easily during the first period of the epidemic and yet have been the source of an outbreak of extreme violence during the recrudescence.

**Thana.** Turning to the districts of the first division, it will be seen that Thana became infected in the month of December, and that the number of cases rose rapidly during January, February and March. The last part of March and first part of April included the worst period and the highest number of indigenous cases (389) was recorded during the week ending the 2nd April. In the beginning of May the number of cases decreased quickly and the fall was rapid throughout May and June. By the end of June the epidemic had for the time died out. In Surat and Kolaba districts the beginning of the epidemic

was much later; both districts became infected in the early part of February. In Surat the disease spread rapidly throughout the latter part of February and the whole of March, and the first part of April saw the climax. Until April was three parts over the number of cases continued to be very high, but after that the decline was rapid. It lasted through May and the first-half of June. By the middle of that month the first period of the epidemic was over in the district. In Kolaba the epidemic was less severe than in Surat. There was little progress until the last week in March, when the number of cases rose and remained at a comparatively high level until the first week in May. The fall was then steady until the beginning of July. Even during that month a few cases continued to occur every week, and with the recrudescence the number again increased. In Janjira State May was the worst month. In the Navsari division of Baroda State the main period of the epidemic was from the middle of March to the end of the first week in May. In Daman plague began early in March. The disease spread with great rapidity and virulence until 60 or 70 deaths occurred daily. By the end of May the violence of the epidemic was spent.

Surat. Kolaba. Baroda territory. Daman.

In the second division Poona City has first to be noticed. The infection appears to have taken hold of the city early in January, it spread steadily throughout January and February, and culminated in the middle of March. The week ending the 26th March showed 345 indigenous cases. The number of cases remained high until the middle of April, and the epidemic then declined rapidly. In Poona district, during the first period of the epidemic, there were never more than occasional indigenous cases. In the Nasik and Ahmednagar districts a number of imported cases occurred during the earlier months of the epidemic, but indigenous cases resulted in only a few instances. Indigenous cases occurred in Kolhapur State from the middle of February onwards without ever increasing greatly in number.

Poona City. Nasik and Ahmednagar.

In the third division the Palanpur outbreak is the chief point to notice. The epidemic was short lived, but for a few weeks the number of cases reported was considerable. The period was roughly from the middle of March to the middle of April, after which only a few cases occurred until the recrudescence. In the Kadi and Baroda divisions of the Baroda territory there were only occasional indigenous cases. In Kathiawar indigenous cases began in February and continued steadily until June.

Palanpur. Kathiawar.

The outbreak at the port of Mandvi in Cutch (fourth division) was not discovered until the middle of April, when the disease had already made great progress. The first week in May showed the enormous

Mandvi.

number of 1,288 cases. From this point the epidemic declined gradually. In the week ending the 4th June the number of cases had fallen to 327, and in the week ending the 2nd July to 44. In August only occasional cases occurred. From Mandvi the infection spread into the interior of Cutch. From February onwards indigenous cases were reported, though at first not in large numbers. The cases were more numerous in May, June and July, and there was a further increase in August and September. In the latter month 522 cases were reported. After September the number of cases again diminished.

## Sind.

**Infected localities.**

Sind was the scene of several violent outbreaks of the disease, but the period of the epidemic was much shorter than in the Presidency Proper and the infection was much less widely diffused. The epidemic was practically confined to the following places :—

Karachi City.

| | | | |
|---|---|---|---|
| Karachi district | ... | ... | ... Kotri. Tatta. Jangshai. |
| Hyderabad district | ... | ... | ... Hyderabad. Tando Alahyar. |
| Shikarpur district | ... | ... | ... Sukkur. Rohri. Villages in the Rohri and Ubauro Talukas |

The Upper Sind Frontier district, the Thar and Parkar district, and the Khairpur State escaped with hardly a case.

**Karachi. Description of the town.**

Karachi stands on a bay of the Indian Ocean, at the extreme northern end of the Indus delta. The census of 1891 showed a population of about 105,200; of these nearly 53,000 were Muhammadans and some 44,000 were Hindus. The entrance to the harbour is between Manora Head and Kiamari Island; the harbour extends five miles northwards from Manora Head to the narrows of the Lyari River. The Lyari River has a low sandy bed and is usually not covered by water. On the east bank of this river lies the main body of the city. Immediately on the bank and adjacent to the harbour is the Old Town, the most densely populated portion of the city. From the Old Town the city extends back into the Market, Napier and other quarters. North and east of the city, and some little distance away from it, is the cantonment, and south-east of the cantonment lie the Civil Lines. On the opposite or west bank of the Lyari there is another quarter of the town known as the Trans-Lyari quarter. It contains twenty settlements of poor Muhammadans of different tribes—fisher people, Sidis, Mekranis, Baluchis, etc., each in their separate village. Twelve of the settlements are

mostly only reed and plaster huts; the remaining eight are inferior houses of a permanent type. At the census of 1891 the population of these settlements was numbered at over 22,000, but the population is now estimated to be over 30,000, or one quarter of the present estimated population of Karachi (124,000). There are also villages on Kiamari Island and at Manora, on either side of the harbour.

Surgeon-Major-General Cleghorn, who visited the city during the early period of the epidemic, gave the following account of the condition of the main portion of the city:—

Insanitary condition of the main body of the town.

"The worst parts of the town are the quarters named Old Town, Machi Miani, Market, and Bandar, where the greatest mortality has occurred. The two former face the bed of a dry stream, extending backwards until they become contiguous with the other quarters. Many of the houses I visited in the quarters above named were quite unfit for human habitation; there were no openings for the admission of air and light, the rooms were overcrowded, and the inmates lived in complete darkness. The Old Town is the worst in all respects, but the overcrowding in houses and of ground area is common to all."

In the report on the plague in Sind Mr. Wingate, who was Acting Commissioner during the period of the epidemic, gives the following description of the beginning of the outbreak:—

Beginning of the outbreak.

"On the 16th December, while on tour, the Acting Commissioner in Sind received intimation from the Health Officer, through the Collector of Karachi, of what was reported to be a 'doubtful' case of plague. A Brahman cook, aged 16 years, resident for nine months in Karachi, stated to have taken ill about the 4th December, was reported on the 8th to the Health Officer to be suffering from bubonic fever. There was high temperature and a bubo. The same evening the patient was removed from Rampart Road, Bandar Quarter, to a house in Maoji Street, Rachor Quarter, where next morning he died. Thus early began that removal from place to place which to the last was difficult to deal with.

"The Acting Commissioner directed definite medical inquiry, but on the 18th he received the Health Officer's report dated the 12th which left no doubt that the disease had broken out in Karachi, and the facts narrated below were reported to Government.

"An old servant of the firm of Radhakishn Tejbhandas & Co. died on the 11th December after, it was said, a 12 days' illness Another servant of the firm, aged 28, also living in the Old Town Quarter, was seen by the Health Officer on the 11th and found to have a temperature of 103° and swellings in both groins. In a house close by, in which four persons had died in the course of a few days, including

a child seen by the Health Officer on the 11th, another child, aged five years, was found sick. On the morning of the 12th, the Health Officer took the Deputy Sanitary Commissioner, Sind Registration District, to view the cases.

**Plague declared epidemic.**

"On the 19th December, at their usual weekly meeting, the Medical Board declared plague epidemic in Karachi. Their report reached the Acting Commissioner on the 22nd, and was the same day communicated to Government by telegram, and the Principal Medical Officer was asked for daily reports of attack and deaths.

**The epidemic dates from the beginning of December.**

"These facts leave little doubt that, from the beginning of December 1896, the disease had got a footing in Karachi. There was nothing in the mortality statistics to indicate the presence of the disease— "

| Week ending | Deaths from all causes. | | Average deaths of 5 years ending 1895. | |
|---|---|---|---|---|
| | Total. | Daily average. | Total. | Daily average. |
| 6th October 1896 ... ... | 83 | 12 | 65 | 9 |
| 13th „ „ ... ... | 51 | 7 | 56 | 8 |
| 20th „ „ ... ... | 61 | 9 | 58 | 8 |
| 27th „ „ ... ... | 59 | 8 | 58 | 8 |
| 3rd November 1896 ... ... | 54 | 8 | 62 | 9 |
| 10th „ „ ... ... | 59 | 8 | 65 | 9 |
| 17th „ „ ... ... | 72 | 10 | 69 | 10 |
| 24th „ „ ... ... | 74 | 11 | 67 | 10 |
| 1st December 1896 ... ... | 80 | 11 | 70 | 10 |
| 8th „ „ ... ... | 85 | 12 | 81 | 12 |
| 15th „ „ ... ... | 86 | 12 | 82 | 12 |
| 22nd „ „ ... ... | 104 | 15 | 102 | 15 |

**Spread of infection.**

The infection first spread in the insanitary and overcrowded quarter of the Old Town and from there [illegible] quarter. But by the end of January it had spread into the Napier and Market quarters and thence it attacked other quarters of the city. In the Trans-Lyari Quarter the cases began to multiply in the beginning of February. The outbreaks at Kiamari and Manora were of later date.

Taking the city as a whole, the beginning of January saw a considerable increase in the number of cases, which continued during the month. From the 28th January the cases again rose considerably and the maximum was reached on the 1st, 2nd and 3rd of February, when the number rose to 59, 49 and 56—a record never subsequently reached. "In fact," says Mr. Wingate, "the epidemic in the first week in February attained its climax, and thereafter, though the outbreaks in new quarters partially obscured the fact, the disease gradually abated." Taken by months the reported mortality from plague was as follows:— January. Climax during the first week in February. Monthly plague mortality.

| | | | | | |
|---|---|---|---|---|---|
| December 1896 | ... | ... | ... | ... | 59 |
| January 1897 | ... | ... | ... | ... | 743 |
| February ,, | ... | ... | ... | ... | 995 |
| March ,, | ... | ... | ... | ... | 864 |
| April ,, | ... | ... | ... | ... | 538 |
| May ,, | ... | ... | ... | ... | 167 |
| June ,, | ... | ... | ... | ... | 23 |
| July ,, | ... | ... | ... | ... | 9 |

Throughout February and March the epidemic continued to be severe; April saw a considerable fall and May an equally large one. In June the cases were only occasional and in July the epidemic died out. Decline.

In Karachi district there were small epidemic outbreaks in Kotri, Tatta and Jangshahi, giving an aggregate of 48 indigenous cases. From the middle of December to the week ending the 19th February, 31 imported cases occurred at Tatta. The influx then appears to have ceased, and no more deaths were reported until plague broke out locally in the week ending the 26th March. Thereafter the epidemic was local and practically ceased early in May. Jangshahi is the railway station for Tatta. It contains a population of only about 200 persons and a sharp local outbreak was easily suppressed by evacuation and disinfection. Kotri is on the Indus and is the railway station for Hyderabad, from which it is separated by the river and two miles of road. Up to the third week in February dropping cases came in from Karachi. Then there was a lull, and not till the week ending the 26th March did the first local case show itself, at the same time with cases imported from Hyderabad, where the disease had just broken out virulently. By enforcing segregation in huts the disease was stamped out after the occurrence of 17 cases.* Karachi district. Tatta. Jangshahi. Kotri.

In the Hyderabad district the town of Hyderabad was the scene of an outbreak which was for a short time virulent and occasioned Hyderabad district.

* A fresh outbreak occurred at Kotri in November 1897.

**Hyderabad City.** a total number of 544 cases. In 1891 the city contained a population of nearly 55,000, and at the time the outbreak occurred it was crowded with Karachi refugees and contained, Mr. Wingate estimates, not less than 65,000 people. The town is healthily situated on a hill and in a dry climate. Imported cases from Karachi occurred for some time before the disease broke out locally. The indigenous cases commenced during the week ending the 5th March and for some time the disease made slow progress. Until the beginning of April the number of cases did not exceed 40 a week, but during the week ending the 9th of that month the number suddenly rose to 117. Next week the number was 119 and then the disease declined almost as rapidly as it had risen. During the week ending the 7th May there were only 37 cases, and by the beginning of June the epidemic had died out. Tando Alahyar was the only other place in the district where the disease became endemic. The epidemic was slight and included only 13 cases.

**Tando Alahyar.**

**Shikarpur district.**

In the Shikarpur district the towns of Sukkur and Rohri, situated on either bank of the Indus, were the scene of a virulent outbreak of short duration. In Sukkur the first indigenous case occurred in the week ending the 12th February. The figures during the early part of the epidemic were obscured by the concealment of cases, but the epidemic did not gain ground rapidly until the latter part of March. During the week ending the 19th March there were 28 cases reported, and during the following weeks the figures were—

**Sukkur.**

| | | | | |
|---|---|---|---|---|
| Week ending 26th March | ... | ... | ... | 97 |
| „ „ 2nd April | ... | ... | ... | 105 |
| „ „ 9th „ | ... | ... | ... | 111 |
| „ „ 16th „ | ... | ... | ... | 87 |

**Rohri.**

After the 16th April the disease steadily declined, and died out by the end of May. Rohri on the left bank of the river did not become infected until the second half of April. The cases exceeded twenty in only one week and the epidemic declined from the middle of May and disappeared before the end of June. From Sukkur and Rohri the disease was spread to several villages in the Shikarpur district and was carried nearly as far as the Punjab border. But the infection did not obtain a strong hold in any place and the vigorous measures adopted quickly stamped out the disease.

**Villages in the Shikarpur district.**

Mr. Wingate gives the following account of the end of the epidemic:—

**End of the pidemic.**

"As already stated, the last plague cases in Hyderabad and Sukkur occurred on the 2nd of June. The town of Rohri and the whole district of Shikarpur were free of plague by the week

ending the 25th June. Plague lingered fitfully in Karachi till the 27th July, when it finally ceased, and the last case was discharged from hospital on the 6th August. In accordance with the terms of the Venice Sanitary Convention of 1897, ten days must elapse from death or discharge of the last case. By Notification No. 4039, dated the 17th August 1897, the City, Cantonments, Harbour of Karachi and the whole Province of Sind were declared free from infection of plague, and on the 5th September there were thanksgiving services in the churches of all denominations at Karachi."

## The Recrudescence in the Bombay Presidency.

The recrudescence began in the month of July 1897, and from August onwards made wide and rapid progress. **Commencemen**

The following is a statement of the number of cases reported from the localities chiefly affected :— **Statistics.**

| Period. | GUJARAT. | | | KONKAN. | | | | DECCAN. | | | | KARNATAK. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surat District. | Cutch State. | Palanpur State. | Bombay City. | Thana District. | Kolaba District. | Nasik District. | Poona. City. | Poona. District. | Sholapur District. | Satara District. | Belgaum District. |
| July . . | 58 | 107 | ... | 62 | 8 | 24 | ... | 60 | 90 | ... | 151 | ... |
| August . | 30 | 237 | 28 | 124 | 36 | 31 | 88 | 77 | 748 | ... | 930 | ... |
| September . | 198 | 522 | 270 | 221 | 106 | 79 | 347 | 296 | 904 | 12 | 2,317 | ... |
| October . | 429 | 464 | 240 | 290 | 79 | 47 | 203 | 1,446 | 558 | 161 | 3,841 | 5 |
| November . | 855 | 336 | 152 | 371 | 33 | 62 | 202 | 2,534 | 763 | 1,149 | 4,549 | 194 |
| December . | 646 | 151 | 275 | 805 | 72 | 36 | 371 | 1,648 | 474 | 1,475 | 2,125 | 342 |
| TOTAL . | 2,216 | 1,817 | 969 | 1,873 | 334 | 279 | 1,271 | 6,061 | 3,537 | 2,771 | 13,913 | 541 |

In the City of Bombay the rise was gradual until the end of November, but in December the epidemic rapidly increased in virulence. **Bombay City.**

The districts of the Konkan Coast, which during the first period of the epidemic were a principal seat of infection, have, during the recrudescence, escaped with comparatively few cases. In Gujarat, Surat district and Palanpur State have again been the scene of epidemics of some magnitude. But the principal seat of infection shifted further east and south and the Deccan districts of Poona, **Konkan Coast.** **Surat and Palanpur.** **Deccan districts**

Satara and Sholapur have suffered most severely. The epidemic has also extended southwards into the Karnatak and a considerable number of cases have occurred in Belgaum district. The outbreak in Satara district has been of exceptional virulence and has extended over a large number of towns and villages. In November over 4,500 cases were reported, a figure which was not approached by any district during the first period of the epidemic. Outside the City of Bombay the month of December showed a general improvement in the places most affected.

**Karnatak.**

**Satara.**

**Improvement in December.**

# CHAPTER VI.

## GENERAL ACCOUNT OF PREVENTIVE MEASURES.

## THE EPIDEMIC DISEASES ACT.

### General Account of Preventive Measures.

In the succeeding chapters of this report an account is given of the measures adopted to combat the plague and to prevent its spread. The following is a brief summary of the measures and the principles on which they were based.

The nature and characteristics of the plague determine the nature of the preventive measures.

The account of the nature and characteristics of the plague given in Chapter II indicates the lines on which the disease can best be combatted and overcome. It has been explained in what manner and to what extent plague is infectious; it has been shown that the excretions of the sick are among the most dangerous sources of infection; that plague can be spread by persons suffering from the disease and by contaminated clothes and other articles; that infection attaches to the houses in which cases have occurred; that dirty and insanitary conditions favour the growth of the disease to an extent which can hardly be over-estimated; that the tendency is for some time to elapse between the occurrence of the first isolated cases and the breaking out of violent epidemic; and that once the malady obtains a firm hold of a locality where local conditions favour its growth, it spreads with a virulence which is almost irresistible.

Classification of the prevent measures.

The preventive measures may be roughly divided into the following classes:—

(1) Measures to suppress the disease in plague centres, and to prevent isolated cases establishing a fresh focus of infection.

(2) Measures to prevent the spread of infection by persons travelling by land.

(3) Measures to prevent the spread of infection by persons travelling by sea.

(4) Measures to prevent the spread of infection by merchandise and food-stuffs.

Measures adopted in plague centre

The following is a summary of the principal measures adopted in plague centres:—

Arrangements to ascertain the existence of plague cases by compulsory report, registration at burning and burial grounds,

house-to-house visitation, and other means. (This is a fundamental measure, for none of the operations can be successful if undetected cases continue to spread infection.) The treatment of plague patients in special hospitals constructed with a view to the segregation of the sick. The disposal of corpses in a manner calculated to prevent their breeding infection. The segregation of persons who have been living with persons suffering from plague. The evacuation of infected buildings and localities, the inmates being accommodated in carefully-supervised health camps. The disinfection and cleansing of houses in which cases of plague have occurred, and the disinfection of contaminated articles, or their destruction if they are of little value. The exposure of insanitary and infected dwellings to light and air. The demolition of insanitary and infected huts. The general disinfection and cleansing of the locality. The general improvement of drainage and other sanitary precautions, such as the abatement of overcrowding.

**Measures to prevent isolated cases spreading an epidemic.**

The measures to prevent isolated cases establishing a fresh focus of infection were similar to those described above. They consisted mainly in the segregation of the sick and of those who had been in contact with them; the disposal of the corpses in a safe manner; the disinfection or destruction of contaminated clothing, bedding and other articles; the disinfection of contaminated conveyances; the evacuation of the dwellings in which the cases occurred, and their disinfection or destruction; the evacuation, if necessary, of the locality, and the adoption of general sanitary precautions.

**Measures to prevent the spread of infection by persons travelling by land.**

Land quarantine was not imposed to prevent the spread of infection by persons travelling by land. All persons travelling from infected localities, by rail, road, or river, were examined by a medical officer, who was given a wide discretion to retain under observation, in suitable and isolated shelter, all persons considered to be likely to spread infection by reason of their symptoms, appearance or the state of their clothes or personal effects, and persons without a fixed abode and who were not likely to be traceable or to give information of the occurrence of plague cases amongst them. This inspection was in general carried out on departure from the infected locality or area, and on the route or at the place of destination.

**Inspection of the railway traffic.**

The whole of India was protected against the Bombay Presidency and Sind by a series of inspection stations on the main lines of railway traffic. Arrangements were also made to keep a watch at their own homes over persons arriving from infected districts. An additional and very necessary precaution was the disinfection of the clothing and baggage of travellers from infected areas, which from its condition or other reasons was deemed to be dangerous. Rules were also promulgated for the disinfection of railway carriages. Precautions similar to those adopted on the railways were put in force

in the case of travellers by road and by river routes.

To prevent the spread of infection by persons travelling by sea, vessels sailing from ports in the infected area, and in the case of vessels sailing for ports out of India, from other principal ports in India, were inspected before departure, and any cases of plague discovered on board were removed. Quarantine was also impressed against the infected ports at other ports in India. The original rules enforced at the ports of arrival were issued under the Quarantine Act (I of 1870) and were similar to those enforced against Hongkong in the year 1894. Revised rules were subsequently issued under the Epidemic Diseases Act (III of 1897) based on the regulations prescribed by the Venice Sanitary Convention of the 19th March 1897. The rules for the medical inspection of vessels before leaving port were also revised after the issue of the Convention.

Measures to prevent the spread of infection by persons travelling by sea.

To prevent the spread of infection by articles likely to carry the seeds of the disease, the importation of rags, used apparel and bedding, waste paper, and used gunny bags, from the Bombay Presidency and Sind into other parts of India was prohibited, both by land and by sea. Precautions were also taken to prevent the spread of infection by grain and other food stuffs.

Measures to prevent the spread of infection by susceptible articles.

## The Epidemic Diseases Act.

It will be convenient at this point to notice the special Act under which the precautionary and remedial measures were framed and enforced. At the end of January, when the plague had, in spite of all precautions, taken a firm hold of Bombay, when it had become epidemic in Karachi and when it had begun to spread to Poona, Ahmedabad, and other places, it became evident that the ordinary provisions of law were not sufficient to enable the local authorities to enforce all the measures necessary to grapple with the emergency, and to prevent, so far as was humanly possible, the extension of the disease to other districts and provinces. Municipal bodies were, it is true, already endowed with extraordinary powers of dealing with disease within their own limits, but these powers were by no means uniform, and only extended to very limited areas. For instance, section 434 of the City of Bombay Municipal Act, 1888, provided for the imposition of such temporary regulations as might be found necessary to prevent the outbreak or spread of disease, and section 334 of the Calcutta Municipal Consolidation Act, 1888, empowered the adoption of similar measures in that City.

Events lead up to the pass of the Epidemic Diseases Act.

Under the powers conferred by section 25 of the Cantonments Act (XIII of 1889), the provisions of sections 434 and 473 of the City

of Bombay Municipal Act were, shortly after the commencement of the outbreak, extended to the Cantonments of Poona, Kirki, Ahmedabad, and Deesa. In a Resolution of the Government of India in the Public Works Department, dated the 23rd October, 1896, bubonic fever was included in the list of infectious and contagious diseases, given in the general railway rules of 1895, thus enabling the measures prescribed in section 71 of the Act for dealing with persons suffering from any such disease to be enforced in the case of plague. But something much more general and wide-reaching was required, and the Government of India determined, having regard to the high mortality resulting from the plague, the persistence of the disease in Bombay and Karachi, the apprehension that it might spread and become epidemic in other places, the injury that was resulting to the trade of the places affected and the country at large, that it was necessary to take special powers by legislation. With this object a Bill "to provide for the better prevention of the spread of dangerous epidemic disease" was introduced in the Council of the Governor General on the 28th January and passed into law as the *Epidemic Diseases Act (III of 1897) on the 4th February. In the discussions in the Legislative Council it was recognized that the urgency of the case made it necessary that the brief enabling Act should receive the force of law with the least possible delay, and that the varied circumstances and emergencies that had arisen and were likely to arise rendered it desirable that the Act should be general in its terms.

**Passing of the Act.**

**Provisions of the Act.**

The Act, which contains only four sections, enables the authorities empowered under it to adopt all precautionary measures that may be deemed necessary. The main provisions are contained in the second section. The first sub-section of that section is based on section 434 of the City of Bombay Municipal Act, and authorizes the Governor General in Council to direct any measures to be taken and any regulations to be prescribed which are deemed necessary to prevent the outbreak or spread of dangerous epidemic disease, and to direct in what manner the expenses incurred shall be defrayed. The second sub-section empowers the Governor General in Council in particular, to take measures and prescribe regulations for (*a*) the inspection of ships arriving at or leaving port and the detention of the ship or of any one on board, and (*b*) the inspection of travellers by railway and otherwise, and the segregation of persons suspected of being infected with the disease. The third sub-section empowers the Governor General in Council to declare that all or any of the

powers conferred by the Act may also be exercised by any Local Government with respect to the territories administered by it. Section 3 makes disobedience to any regulation or order made under the Act an offence punishable under section 188 of the Indian Penal Code.

Conferring of powers on Local Governments and Administrations under the Act.

The intention of the Government of India in passing the Act was that regulations for dealing with the epidemic should, subject to the general control of the Governor-General in Council, generally be made by the Local Governments, who, with their greater local knowledge and experience and with their greater facilities for gauging local opinion and enlisting local sympathy, were in the best position to devise regulations to meet the particular circumstances which had arisen and might arise in the territories under their administration. Accordingly, on the day that the Act received the force of law the Maritime Governments of Bombay, Madras, Bengal, and Burma were empowered* to exercise all the powers conferred by the Act. The Governments of the North-Western Provinces and Oudh, the Punjab and the Central Provinces, whose territories stood in danger of the spread of infection by land, were given powers under the first, or general, sub-section of section 2, and also under the clause of sub-section 2 authorizing the examination and detention of travellers. In Assam, Coorg, and Baluchistan, where the danger was more remote, powers were conferred on the Chief Commissioner under this latter sub section only. At the same time a notification issued applying the Act to all territories in India which are under the administration of the Governor General in Council, but are not part of British India including the Baluchistan Agency and railway lands; and in a second notification the administrations of these territories were given powers under the clause authorizing the examination and detention of travellers. Other notifications conferring powers on Local Governments and Administrations were issued from time to time as occasion arose. On the 12th February powers under the general sub-sections were conferred on the Resident at Hyderabad for the Civil and Military Station of Bangalore. On the 16th February the Chief Commissioner of Ajmere-Merwara was granted powers under the railway inspection clause, and on the 6th March under the general sub-section. On the 1st March powers under the general sub-sections were conferred on the Agent to the Governor General in Baluchistan. On the 3rd April powers under the same sub-section were conferred on the Resident at Hyderabad for the Hyderabad Residency Bazaars, the Cantonment of Secunderabad, the stations of the Hyderabad Contingent, and the Hyderabad Assigned Districts. On the 15th of April powers under the same sub-sections were conferred on the Agent to the Governor General in Central India for the Cantonments of Mhow, Neemuch, and Nowgong.

* Home Department Notification No. 302 (Sanitary), dated the 4th February 1897, Appendix IV.

The series of notifications conferring powers on Local Governments and Administrations are given in Appendix IV.

**Enactments against plague passed in Native States.**

On the 11th February the Mysore Government passed a Regulation (II of 1897) in the same terms as the Epidemic Diseases Act, and subsequently issued rules and orders under it. The Maharajah of Travancore and the Rajah of Cochin also issued Regulations based on the Act. These Regulations are set forth in Appendix IV. The Baroda Darbar issued a series of well-devised rules for checking the epidemic in Baroda territory.

**Rules and orders issued by Local Governments and Administrations under the Act.**

Both the Government of Bombay and other Local Governments and Administrations issued a number of rules and orders under the powers conferred on them under the Epidemic Diseases Act, for the purpose of regulating the operations against plague. These regulations are examined and discussed in the portions of this report which deal with the matters to which they refer. As the regulations on different matters are in many instances gathered together in one resolution or notification, the general orders issued by the principal Local Governments, dealing mainly with the measures taken to suppress outbreaks, to prevent the occurrence of isolated cases resulting in epidemics, and to prevent the spread of infection by persons travelling by land, are grouped together in the Appendix IV. The rules and orders issued by the Governments of Bombay, Madras, Bengal, the North-Western Provinces and Oudh, and the Punjab are given at length. Similar rules and orders were issued by a number of other Administrations, both within and without British India. These follow the lines of the rules and orders issued by the principal Local Governments, and it is not necessary to reproduce them. The orders issued for the regulation of sea traffic and to meet special circumstances are given in the appendices to the appropriate chapters. In order that each Local Government and Administration might have the advantage of the experience of other Provinces, the Government of India directed each Government to send a copy of all the rules it issued under the Epidemic Diseases Act to every other Government in India.

**Orders issued by the Government of India under the Act.**

The Government of India found it necessary to take action themselves under the Epidemic Diseases Act in only four classes of cases. The orders issued by the Government of India referred to the prohibition of the pilgrimage to Mecca, to the prohibition of emigration from India, to the temporary prohibition of the booking of railway fares to certain localities with a view to prevent the assemblage of large religious gatherings, and to the prohibition of the importation of certain articles likely to carry the seeds of infection from the Bombay Presidency to other parts of India. These matters are discussed in later chapters of this report.

# CHAPTER VII.

## MEASURES IN THE CITY OF BOMBAY.

In this chapter the measures devised and adopted in the early period of the epidemic will first be noticed and a description will then be given of the system of remedial and preventive operations carried out by the Special Plague Committee, of which General Gatacre was the President.

### Measures during the early period of the Epidemic.

Beginning of the epidemic.

Dr. Viegas, a private medical practitioner of Bombay, discovered cases he believed to be plague about the 26th September; the Government of India at once deputed M. Haffkine, the bacteriologist, to Bombay to investigate the disease, which was officially affirmed to be plague on the 29th September and this statement was shortly afterwards confirmed by M. Haffkine. It will be remembered that the disease was mild during the month of October, diminished somewhat in the first half of November, and from December to the end of February spread and increased with the utmost virulence. From the beginning of March the strength of the epidemic gradually declined, until in July only isolated cases occurred.

General course of the epidemi

Conduct of operations by the municipal authorities.

Until the appointment of General Gatacre's Committee on the 9th of March, the remedial and preventive measures were carried out by the municipal authorities of the city, within the scope of whose functions the care of the public health lies. The following brief account of the constitution of the municipal government of the city, and of the special sections of the municipal law dealing with the suppression of infectious and epidemic disease, will make it easier to follow the conduct of the operations.

The constituti of the municip government.

The law relating to the municipal government of the City of Bombay is contained in the "City of Bombay Municipal Act—Bombay Act No. III of 1888," as amended in some portions by later Acts of the Bombay Government. The municipal authorities charged with carrying out the provisions of the Act are—

(1) a Corporation,

(2) a Standing Committee, and

(3) a Municipal Commissioner.

The Municipal Corporation consists of seventy-two councillors, of whom thirty-six are elected at ward elections, sixteen are elected by the Justices of the Peace for the City of Bombay, two are elected by Fellows of the University of Bombay, two are elected by the Bombay Chamber of Commerce, and sixteen are appointed by the Local Government. The general municipal government of the city is vested in this corporation. The standing committee consists of twelve councillors, eight appointed by the corporation and four by the Government. This committee transacts the general business of the corporation, and their special functions are indicated in numerous sections of the Act. The Municipal Commissioner for the City of Bombay is an officer appointed by the Government. In him rests the entire executive power for the purpose of carrying out the provisions of the Municipal Act. He also controls the municipal staff; he is vested with certain special powers by the Act; and in cases of great emergency he is empowered to take what action he considers necessary on his own authority. During the period of the plague epidemic Mr. Snow was the Municipal Commissioner, Surgeon-Lieutenant-Colonel Weir was the Executive Health Officer, and Mr. Murzban was the Executive Engineer.

**Regulations of the Municipal Act against dangerous disease.**

The general regulations for the prevention of the spread of dangerous disease are contained in sections 421 to 433 of the Municipal Act. The following are the main provisions of these sections. Medical practitioners are bound to give information of any cases of dangerous disease that may come to their cognizance. The Commissioner may inspect any place in which dangerous disease is said to exist, and may take such measure as he may think fit to prevent its spread. He may prohibit the use for drinking purposes of water likely to cause dangerous disease. He may order the removal of patients to hospital. He may cause buildings to be disinfected and huts and sheds to be destroyed. He may direct the disinfection or destruction of clothing, bedding, or other infected articles. He may provide and maintain conveyances for the carriage of the sick. All persons are also prohibited from trafficking, etc., in contaminated articles, and from letting any infected building or part of a building until it has been properly disinfected. The drivers of public conveyances are prohibited from carrying infected persons, and the latter are prohibited from using such conveyances.

**Section 434 of the Municipal Act.**

In addition to these measures for ordinary occasions section 434 of the Act empowers the Commissioner, with the sanction of the Local Government, in the event of the city being visited or threatened with an outbreak of dangerous disease, to take such special measures and prescribe such temporary regulations as he may deem

necessary. It will be remembered that the first or general sub-section of section 2 of the Epidemic Diseases Act was based on this section of the City of Bombay Municipal Act.

First measures

While the nature of the disease was still under discussion the Government of Bombay directed their principal sanitary and medical adviser, the late Surgeon-Major-General Cooke, to furnish full information regarding the facts that had been ascertained with regard to the epidemic and to suggest, in consultation with the Municipal Commissioner, further measures with a view to obtain correct information as to the daily progress of the disease, and to prevent its spread. In a letter, dated the 29th September Surgeon-Major-General Cooke reported to the Local Government that the disease was no doubt plague, that it was of a mild type, and that it had probably existed in the city for over a month. He assured the Government that the Health Department of the Municipality was acting with the utmost activity in the infected area, and that a large establishment of inspectors and labourers was at work under the superintendence of Surgeon-Lieutenant-Colonel Weir.

Activity of the Municipal Heal Department.

In the district examined by Dr. Cooke sea water was pumped all night through the sewers by a powerful centrifugal pump. Fires of tar and sulphur were lighted at the foot of the staircases leading to houses and in the corridors of houses. Limewashing and cleansing of walls and lanes were in active progress, fire-engines being employed in the work. In addition to these measures, Dr. Cooke suggested the following further precautions: an increase in the sanitary and medical staff of the Municipality; arrangements to detect the disease should it occur in suburban municipalities; the segregation of the sick in hospital; the disinfection or destruction of the bedding of patients, and of all other bedding found in the house or rooms occupied by the patient; and more complete arrangements for carting away filth from sewers.

Committee appointed by tl Local Government.

Before the end of September the Local Government appointed a committee, of which Mr. Snow was the Chairman, and the members of which were chiefly medical officers of the Government and private medical practitioners, to consider remedial and sanitary measures. Dr. Cooke attended the meetings of the committee. At the first meeting, which took place at the end of the month, the suggestions made by Dr. Cooke were discussed and Surgeon-Major Manser insisted on the necessity for the complete disinfection of every house in which cases were known to have occurred. He suggested that the inhabitants of such houses should be removed to empty houses or tents on the Port Trust Estate. Mr. Snow pointed out that under the Municipal Act the Municipal Commissioner

would need to apply to the Government for special powers to carry out certain of the suggestions, and a resolution was adopted by the meeting that the Municipal Commissioner should be requested to apply for such powers. On the 2nd of October the Local Government conferred powers on the Commissioner under section 434 of the Municipal Act to take whatever measures were found necessary to prevent the epidemic from spreading. The corporation voted a large grant for the purpose, and a large additional medical staff was employed to carry out the extensive sanitary measures, the adoption of which was advised.

**Powers conferred on the Municipal Commissioner under section 434 of the Municipal Act.**

**Proclamation of the Municipal Commissioners.**

On the 6th of October the Municipal Commissioner issued a proclamation under section 434 of the Municipal Act making provision for the removal to hospital of all plague patients and the disinfection and evacuation of infected houses. The assistance of the police was to be employed where necessary. The population evinced the greatest alarm and excitement at the suggestion for the compulsory removal of the sick to hospital, and the increase in the epidemic, coupled with the operations in progress, produced widespread alarm. People fled from the city in large numbers. On the 10th of October a number of mill-hands assembled outside the Arthur Road Hospital and threatened its demolition as well as violence to the employés. On the afternoon of the 20th October a gang of nearly one thousand armed mill-hands attacked the same hospital, and were dispersed by the police. The incident was a grave indication of the general feeling. The large Municipal conservancy staff became affected by the general feeling of unrest and it was feared that a strike might occur among them. Mr. Snow stated that such a strike would have had the most appaling results. "Bombay would, in a few days, have become uninhabitable and left to reek in a mass of sewage, sweepings and pollution, with no one at hand to conduct the daily routine of sanitation, much less to adopt a single preventive measure against plague."

**Alarm and excitement of the population**

**Modification of the orders.**

On the 16th of October, the Commissioner issued a memorandum to the Health Officer stating that as only a few cases of bubonic fever had been reported within the past few days, and as influential petitions and representations had been made against the removal of patients to the Arthur Road Hospital, patients should not be removed if they were living in houses where they could be properly attended and isolated in a reasonable degree. Also that every possible consideration should be shown to the caste and prejudices of persons whose houses the Health Department officials had to enter. To allay the alarm and the opposition excited by the fear of compulsory segregation of the sick, a further proclamation was issued by the Commissioner on the 30th of the month, in which it was stated that the

**Explanatory proclamation.**

object of the notification had been misunderstood, as it was principally intended to meet the event of a large increase of plague. It was further stated that no cases would be removed to hospital which could be properly treated and segregated on the premises, and that in cases which required removal, no action would be taken except upon the certificate of a duly qualified medical practitioner.

Extent to which isolation of the sick was enforced.

These orders had the effect of greatly restricting the segregation of the sick, but it is stated in Mr. Snow's Report on the Plague in Bombay that all attempts at isolation were not given up. "The mere proposal of this measure," says Mr. Snow, "resulted in the majority of the cases being concealed, but when they were detected arrangements were invariably made in the patients' own houses to give them the best chance of recovery possible by removing them to the lightest and best ventilated rooms, and every endeavour was made to dissuade all but the few necessary attendants from frequenting that part of the dwelling. At the same time, where circumstances made it absolutely impossible to make any suitable arrangements, or where the patients were paupers or friendless, they were removed to the Municipal Hospital at Arthur Road."

Private and Caste Hospitals

The following extract from Mr. Snow's report shows the extent to which an endeavour was made to overcome the opposition of the people to the segregation of the sick in hospital by encouraging the establishment of private caste and sect hospitals:—

"As early as October private hospitals for Hindus on these lines were opened in Mandvi and Bhuleshwar, but this effort proved abortive, the unreasoning terror of hospital-life was still in full vigour and extended even to institutions managed entirely by men of their own class. Those from whom co-operation rather than obstruction might have been expected backed up the unreasoning voice of public opinion by the specious argument that hospitals, while unnecessary in themselves, were a source of the utmost danger to their vicinity. In December, however, more successful efforts were made in this direction. A Jain Hospital was erected in the compound of the Arthur Road Institution, a little later Dr. Bahadurji opened a most successful and well managed hospital for Parsis in Parel, and on the 28th January a Hindu Hospital, which did excellent service, was opened under the efficient management of the Hon'ble Dr. Bhalchandra Krishna. Similarly, the Port Trustees opened a model hospital at Wari Bandar for their employés on the 23rd December, and through the energy of Professor Muller an institution was started at Modikhana for the servants of Europeans on 31st January. It may also be mentioned that a temporary hospital was erected in December by

the Health Department at Narelwadi for the benefit of the people of that locality which was at the time being very severely visited."

**Increase of hospital accommodation.**

The opposition to the segregation of the sick continued so strong that up to January the Arthur Road Hospital was only half full. By the end of January the patients had increased in number and the hospital arrangements at Grant Road were extended. The services of the Sisters of the Convent at Mazagon were procured as nurses, and quarters were erected for them. The staff of the hospital was augmented and another ward was added to it.

**The Plague Research Committee.**

The next step in the operations to be noticed is the formation of the Plague Research Committee. This Committee of experts was appointed to enquire into the nature and history of the diseases by a resolution of the Government of Bombay of the 13th October. Five scientific experts served on the Committee. Surgeon-Major R. Manser, the President of the Committee, investigated the treatment by drugs; M. Haffkine undertook the study of the plague microbe itself, its effect on human and animal bodies, and the questions of immunity, protective inoculation, and the use of therapeutic serum; Mr. E. H Hankin, the Chemical Examiner and Bacteriologist for the North-Western Provinces and Oudh, another expert in bacteriology, occupied himself with questions connected with the plague bacillus in nature, in water, the soil, food-stuffs and other articles; Surgeon-Captain L. F. Childe was engaged on the pathologo-anatomical part of the investigation; and Dr. Nasarvanji Fakirji, Surveyor, dealt specially with the question of plague epidemic in rats.

**Sanitary measures in November and December.**

Throughout November and December the cleansing, disinfection and sanitary measures were pushed on vigorously, without however making headway against the disease, which now began to rapidly increase in violence.

**Surgeon-Major-General Cleghorn visits Bombay.**

At the beginning of January the Government of India directed Surgeon-Major-General Cleghorn to visit Bombay with a view to inform himself fully on the existing state of affairs and to advise on the situation. After making a careful investigation on the spot and holding consultations with the local medical officers and private practitioners, Dr. Cleghorn presented to the Government of India a note dealing with the position and a memorandum on the plague signed by a number of the medical officers of the Government and principal medical practitioners of the city. The gentlemen who signed the memorandum were of the opinion that the bubonic plague then prevailing in the city was, under certain circumstances, only slightly

**Memorandum of Bombay medical gentlemen recommending the removal of the inmates of infected houses.**

contagious and infectious, and that the facts observed in connection with individual cases and those associated with the general progress of the disease, warranted the conclusion that its incidence was greatly due to local conditions. In other chapters of this report ample illustrations are given to show how completely this opinion was in accordance with the previous experience of plague epidemics in India and in other countries, and how fully it was justified by the experience subsequently gained in the City of Bombay and elsewhere in the Presidency. The medical gentlemen also expressed an emphatic opinion that the only practical method of dealing with the outbreak and of arresting the progress of the disease was the removal of the inmates from houses in which cases of plague occurred, and the subsequent complete cleansing, disinfecting and sanitary overhauling of the premises. They suggested that suitable huts should be provided, free of rent, for the accommodation of different classes, and they believed that it only required the concurrence and sympathy of the leaders of the different sections of the native community to render the scheme a success. In pointing out the necessity for adopting the course recommended, stress was laid on the fact that the untiring energy displayed in the systematic cleansing and disinfecting of the affected parts of the city had failed to arrest the progress of the disease.

Dr. Cleghorn's concurrence.

In the note which he presented to the Government of India, Dr. Cleghorn expressed the fullest concurrence with the views of the medical gentlemen who signed the memorandum. He stated that so far as general sanitary precautions went, the municipal authorities were displaying the utmost energy. The whole city was under the inspection of the Health Department. All latrines, drains and narrow lanes were being flushed, houses were, as far as possible, being cleansed, disinfected and whitewashed, and in those parts of the city which were not drained, surface drains of excellent construction were being made in connection with the house-pipes. The efforts of the Health Department were, however, to a certain extent frustrated by the difficulty they found in carrying out their operations in inhabited houses, and this important difficulty the suggestion of the medical gentlemen would overcome. Dr. Cleghorn gave the description, which has been quoted in another place, of the insanitary condition of the tenements in which the majority of the poor classes lived, and he represented that the evacuation and thorough disinfection of these edifices was the only course likely to stay the epidemic. Dr. Weir, who was alive to the importance of this matter, was gradually inducing the inhabitants to vacate infected houses, but he required more assistance.

Energy with which sanitary improvements were being prosecuted not sufficient to st the disease.

**The Government of India recommend the proposal to evacuate infected houses to the Government of Bombay.**

In a letter, dated the 19th January, the Government of India earnestly recommended these suggestions to the Government of Bombay. They stated that in the crisis that had arisen there should be no hesitation in taking the strongest measures to prevent the spread of the epidemic, which was menacing the whole of India, even though they might be distasteful to the people affected. The particular measures advocated in the memorandum, namely, the removal of all persons from infected houses and the thorough disinfection of those houses, appeared to the Government of India to be well calculated to check the progress of the disease, and the vigorous action that had been taken to clean and disinfect the infected parts of the city having failed to arrest the progress of the epidemic, the Government of India considered that the measures advocated in the memorandum should be adopted, and that temporary accommodation suitable to the families to be removed should be at once prepared.

**Summary of the measures adopted presented to the House of Commons.**

On the 22nd January the following summary of the measures at that time being carried out in the city was given by Lord George Hamilton in the House of Commons:—

"The efforts of the Government and of the Corporation, between whom hearty co-operation exists, were devoted to relieving sufferers from the plague, to checking its extension in Bombay and Karachi, and to preventing its spread elsewhere. Hospital space was increased, special plague hospitals were provided for six different sections of the community and are being prepared for two other sections. House-to-house visitation is being carried out under medical supervision. Every suspected case of plague that is not at once removed to the hospital is isolated as far as practicable. Every house where a plague case has occurred is disinfected, and is, as far as possible, vacated, temporary accommodation being provided elsewhere. Insanitary houses are pulled down, in others partitions are removed or ventilation introduced. Special sanitary precautions and improvements have been carried out in the backward parts of Bombay City. A fuller staff of doctors and Indian medical men is being organised, and the Bombay Government will indent on England for a temporary staff of doctors and nurses, if more aid is required."

**The position having become worse, the Government of India again recommend the evacuation of infected houses.**

On the 9th February, the position having in the meantime become much worse, the Government of India telegraphed to the Government of Bombay in continuation of their letter of the 19th January, again impressing on that Government the importance of giving effect to the suggestions contained in the memorandum of the medical gentlemen. The Government of Bombay replied on the 10th February that the evacuation of all infected houses and the

removal of people to temporary dwellings was deemed impracticable if carried out on a large scale and by force. They stated that all that was practicable was being done by persuasion. Vigorous action was being taken for the demolition of insanitary huts, and regulations were about to issue under the Epidemic Diseases Act providing for the evacuation of infected houses, the entry into and cleaning, etc., of deserted houses, the prohibition of the further use of evacuated and deserted houses, the summary abatement of overcrowding and the closing of houses unfit for habitation. House-to-house visitation was being conducted energetically in order to ascertain the existence of plague cases, and houses needing cleaning or unfit for habitation were being marked with a view to the remedy of the defects.

The Governm of Bombay po out difficulties carrying out the measure o a large scale.

The Government of India replied in a telegram dated the 12th that they had learnt with regret the opinion of the Government of Bombay with regard to the evacuation of infected houses and the removal of the inmates to temporary dwellings. In view of the great gravity of the situation and the manifest importance of rigorous action they desired the Government of Bombay to reconside their decision. They considered that the measures described by the Government of Bombay were very useful, but were not calculated to take the place of the removal of the inmates of infected houses to a healthy locality. This course appeared to the Government of India to be the only one left which offered a hope of subduing the epidemic. They again urged that sufficient temporary accommodation should be supplied in a healthy locality.

The Governm of India consi that the experiment should be mad and that temporary accommodatic should be at once provided

On the same day that this telegram issued the Government of Bombay sent a letter explaining in greater detail their objections to the proposed evacuation of infected houses on a large scale. These objections were mainly the difficulty in providing temporary accommodation for the very large number of people who would be removed from their homes, the opposition to be expected from the inhabitants of the city, and the panic the measure would be likely to occasion amongst them. The Government of Bombay were advised that it would be necessary to provide for the accommodation of about 30,000 persons in camps outside the city, and that this accommodation could scarcely be prepared before the rainy season made it unfit for habitation. The inhabitants of the city also had the greatest fear of their sick or themselves being removed from their houses. The attempt to enforce removal on a large scale could probably result in great panic. The people would refuse to go to the health camps provided for them, and would flee from the city in thousands, spreading the infection of plague all over the country.

More detailed explanation o the difficulties made by the Government Bombay.

**The Government of India suggest that the experiment should be made for the worst quarters.**

The Government of India replied to these representations in a telegram dated the 21st. They pointed out that the experiment had already been tried in Karachi with success, whilst in Bombay matters were getting worse and worse and the health of the whole continent of India was menaced. They suggested that although accommodation for the whole city could not be prepared at once, such accommodation might be prepared for the inmates of infected houses in the worst part of the city, at that time the north of the Island. The Government of India had no apprehension that the preparation of healthy accommodation would occasion the panic or other evils described in the letter of the Government of Bombay, and they thought that any difficulties in inducing the inhabitants of the worst quarters to seek comparative safety in a healthy camp could be removed if the necessity were carefully but quietly explained. The experiment having been started for the worst quarters it could then be extended.

**Measures adopted by the Government of Bombay to give effect to the wishes of the Government of India.**

To this telegram the Government of Bombay replied on the 23rd that on the occurrence of plague, and even before its breaking out, groups of workmen had limewashed dwellings, cut off the water-supply, and taken off roofs, etc. In this way hundreds of house had been vacated and were being kept empty. Simultaneously huts had been and were being erected, and every effort was being made to induce the people to enter them. The Government of Bombay stated that it would be seen from these details that the desire of the Government of India that infected houses should be evacuated and thoroughly disinfected was being studiously prosecuted.

**Mr. Snow's remarks on the evacuation of infected houses and localities.**

The following remarks on the evacuation of infected houses and localities are contained in Mr. Snow's Report:—

"The importance of evacuating infected houses and localities was realized at an early date, and, when the disease appeared with concentrated virulence in a particular house, the whole of the residents were removed. Wholesale operations in this direction commended themselves to many men of light and leading, who could not reconcile themselves to the idea of compulsory isolation of the sick. On the 11th December an influential committee was formed and approached me with the object of forwarding these views. A camp of refuge for the whole of Bombay was an utterly impossible scheme: but the proposal was obviously in the right direction, and I gave the committee all the assistance and co-operation in my power. Camps were opened for the healthy at Connaught Road and Northbrook Gardens, capable of accommodating 1,500 people, as an experimental measure, but the difficulty of success in this direction was shown by the fact that these camps were hardly used. Nevertheless the principle was successfully put into operation at various local centres of the epidemic

and in all the outlying villages,—such as Naigaum, Siwri, Koliwada, Worli, etc.,—it was the invariable practice to persuade or coerce the people to leave their houses for temporary sheds erected in the fields, and this measure was generally attended with the most satisfactory results. Rao Saheb Ellapa Balaram at this time rendered great assistance to the cause of hut segregation by himself erecting and working at Foras Road a temporary camp of sheds of considerable extent for several months. The same course was followed by the Bombay Tramway Company, several clubs, hotels and mills, and many business firms in Bombay, and there are not a few instances where groups of families clubbed together and did the same. At the height of the epidemic and afterwards the whole of Northern Bombay where suitable sites could be obtained was studded with segregation huts; to say nothing of the very large number of people encamped along the Maremma at Santa Cruz, Andheri, Goregaum and northwards: most of the refugees remained in camp till the middle of May when the disease had almost vanished."

Regulations for the City of Bombay issued under the Epidemic Diseases Act.

The regulations for the City of Bombay alluded to in the telegram of the Government of Bombay of the 10th February were published in a notification of the same date issued under the Epidemic Diseases Act. The regulations provide for—

(1) prohibition of the further use of insanitary dwellings;

(2) summary abatement of overcrowding;

(3) vacation of buildings for the purpose of cleansing, disinfection, etc., or otherwise for the purpose of checking the spread of disease;

(4) entry into deserted buildings their cleansing, disinfection and ventilation, and the disinfection and destruction of dangerous articles found in them;

(5) summary entry into and cleansing and disinfecting of other buildings, and the disinfection or destruction of property found in them;

(6) limewashing, digging up floors, removal of roofs, and burning of substances in dwellings;

(7) cutting off of water connection;

(8) demolition of buildings unfit for human habitation.

Payment of compensation and incidence of expenditure.

Provision is also made in the rules for the payment of compensation and the incidence of expenditure. With regard to the payment of compensation, a general rule was laid down in accordance with the Municipal Act that the Commissioner might in his discretion allow compensation for damage done in the execution of the

matters provided for in the regulations, but that no one should be entitled to claim compensation. Special rules were laid down with respect to compensation for demolished buildings. These rules require that the building shall be surveyed and assessed by a person appointed by the Government, that the valuation shall be final and conclusive, and that the owner shall be entitled to recover the amount thereof out of the municipal fund, but shall not be entitled to receive any further or other sum by way of compensation. The rules further provide that in assessing the value of the building regard shall only be had to the actual market value of the structure, and that no allowance shall be made, nor any compensation paid, for compulsory demolition or otherwise.

With regard to the incidence of expenditure, it is laid down in rule 6 that the expense of cleansing and disinfecting buildings should be defrayed, in the first instance, by the Municipal Commissioner, but should, at his discretion, be recoverable from the owner or occupier.

**Establishment of Parel Government House Hospital.**

In the middle of February a new large Government hospital was provided for plague cases. This hospital was established in the old Government House at Parel in the north of the Island, which was lent by His Excellency the Governor of Bombay for the purpose. The hospital staff was provided by Brigadier-General Gatacre, the General Officer Commanding the Bombay District. It was at first fitted up for 150 beds, but was capable of being extended to hold 250 patients. Two commissioned medical officers were placed in charge of the hospital, assisted by an Assistant Surgeon and two hospital assistants. Ward orderlies and attendants were supplied by volunteers from native regiments, and the nursing staff from the St. Joseph's Convent at Bandora. In reporting these arrangements for the confirmation of the Government of India, the Government of Bombay stated that they anticipated great indirect benefit from a measure which brought the military into touch with the civil authorities in organising measures for preventing the spread of plague, for it had become probable that the civil authorities might before long be driven to seek considerable assistance at the hands of the military.

**Appointment of the Bombay Plague Committee.**

This event brings the narrative up to the time when the Government of Bombay decided to entrust the operations against plague in the City of Bombay to a special Committee under the chairmanship of Brigadier-General Gatacre. The measures devised and executed by this Committee will be described in the second portion of this chapter.

## Operations carried out by the Plague Committee.

### APPOINTMENT OF THE COMMITTEE.

Resolution of the Government of Bombay appointing the Committee.

By a resolution of the Government of Bombay dated the 9th March, the following gentlemen were constituted a Committee for the purpose of carrying out, under the orders of the Government, the measures to be taken to suppress and prevent the spread of plague in the City of Bombay :—

(1) Brigadier-General W. F. Gatacre ... *Chairman.*
(2) Mr. P. C. H. Snow
(3) Surgeon-Major H. P. Dimmock } *Members.*
(4) Mr. C. C. James

Powers conferred on the Committee.

The resolution appointing the Committee invested them with the full powers conferred on or vested in the Municipal Commissioner by the Municipal Act of the city, by the notification of the Municipal Commissioner of the 6th October described in the first portion of this chapter, and by the notification of the Government of Bombay of the 10th February, the terms of which have also been summarised above. The Municipal Corporation, all officers and servants of the Corporation, and all public servants and persons employed by the Committee were directed to carry into effect, without delay, any measures which might be ordered by the Committee. In accordance with the orders contained in the notification of the 10th February, all expenditure was to be met, in the first instance, by the Corporation, and the Corporation or the Commissioner were empowered to make recoveries from private persons in accordance with the provisions of the Municipal Act. The Commissioner of Police was directed to give such assistance as might be necessary on the requisition of the Committee. In a later notification (dated the 23rd of March) the Committee were specially empowered to cause the inmates of any building in which it was believed that a case of plague had occurred to be segregated for a period not exceeding ten days.

Objects with which the Committee was appointed.

* "In a letter addressed to the President of the Municipal Corporation (explaining the object with which the Committee had been appointed) His Excellency the Governor of Bombay said that so thorough had been the cleansing operations carried out by the municipal executive that the continued existence of plague in the city was conclusive proof that it could not be stamped out by any measures of

* Extract from General Gatacre's report.

Larger and different measures needed

disinfection. 'Larger and different measures' were therefore needed to bring it under in reasonable time. The first thing to be done was to search for and discover the cases, and provide hospitals for each caste in convenient places, and to watch persons who were living in the same house with a sick person. The plague had spread to many places outside Bombay. To deal with it now the efforts put forth required to be far-reaching and systematic, and to aim above all things at the suppression of the epidemic before the rains. This was why Government had decided to take the management of the epidemic into its own hands, to systematise and direct the efforts of individuals and bodies, and prevent dissipation of energy, etc. No slur was intended on local administration or self-government; the appointment of the Committee was 'an Imperial necessity' which should meet with the support of all the citizens of Bombay."

Objects to be attained by the Committee.

His Excellency the Governor stated to General Gatacre, in a letter that is reproduced in the latter's report, that the energies of the Committee should be directed to the attainment of three main objects—

(1) The discovery of all cases of plague.

(2) The treatment of all cases in hospitals.

(3) The gradual segregation, as far as possible, of the probably affected—that is, of those living in the same room with, or in close attendance on, persons suffering from plague.

His Excellency laid special stress on the fact that in all cases of obstinacy or misunderstanding on the part of those for whose benefit the measures were devised, persuasion and gentleness should be used; that the privacy of women should be disturbed as little as possible, and only by women; and that the caste and religious usages of the people should be treated with all consideration. His Excellency further stated that every advantage should be taken of the services of natives of influence, such as the Justices of the Peace who had offered their services, also that the hospitals should, as far as possible, be open to the friends and relatives of the patients, who should be accommodated near to them, and encouraged to come and see for themselves that the patients were well cared for.

Enlistment of the services of influential native gentlemen.

## THE OPPOSITION ENCOUNTERED AND THE MANNER IN WHICH IT WAS OVERCOME.

Attitude of the native community.

The remarks made by His Excellency the Governor in his letter to General Gatacre lead up to the subject of the opposition encountered

from some sections of the native community in enforcing the regulations necessary to combat the epidemic of plague in the City of Bombay and elsewhere. In the first portion of this chapter some account has been given of the strenuous opposition raised to the segregation of the sick in hospital. In the present portion of this chapter and in succeeding chapters it will often be necessary to allude to similar matters and the difficulties to be overcome and the way in which they were met will not be rightly understood unless the attitude of the native community towards the enforcement of plague precautions is borne in mind. It is the habit of mind of Asiatic races, and especially amongst the more ignorant of the population, to regard events such as a plague epidemic as a visitation of fate, and as such, to submit to them with patience, but without an effort to do what is humanly possible to mitigate the calamity. They are also ignorant or distrustful of the methods which Western science has pointed out as the most efficacious for the protection of the public health and the extirpation of epidemic disease. Added to this, both Hindus and Muhammadans view with the greatest dislike any intrusion into their homes, and especially any possible interference with the privacy of their women. Among Hindus, again, the caste system and its elaborate rules prevent the intimate association, and especially the feeding in common, of the superior and inferior castes. These habits of mind and dictates of religious and social custom greatly increase the difficulty of enforcing the precautions essential to check the virulence of an epidemic disease, such as plague. Both in the City of Bombay and elsewhere the authorities who bore the responsibility of the operations kept these matters constantly in view and the precautionary measures were always devised so as to interfere to the least possible degree with the feelings and the customs of the people for the protection of whom they were devised.

Privacy of the home and of women and the caste system.

Adoption of precautionary measures to the feelings of the native community.

In the case of the City of Bombay the greatest opposition was experienced from the Sunni Muhammadans, and especially the Konkani Sunnis. General Gatacre makes the following remarks with regard to the attitude of these Muhammadans:—

Opposition of the Sunni Muhammadans in Bombay.

"In the case of the Muhammadan community, and particularly of the Konkani Sunnis, much difficulty was at first experienced in bringing them to reason. The *non-possumus* attitude which they at first adopted is well illustrated by the proceedings at a meeting called by Hadji Oomer Jamal on December 28th for the purpose of persuading the community to assent to segregation. Most of the speakers were in favour of prayer as the best way of averting the

disease, and when the promoters of the meeting tentatively suggested segregation, an old Muhammadan gentleman, as spokesman for certain sections of the community, said, 'he might mention that they were totally opposed to segregation and that nothing would persuade them to send their plague-stricken to the municipal hospital.' A young Muhammadan then arose and, in supporting the last speaker, remarked: 'We will not go to hospital. Our musjid is our hospital.' And this seemed to find favour with the meeting.—(*Times of India*, December 29th.)

"As regards the hospitals themselves, any and every objection was put forward against them. The same Kazi, who is mentioned below as having any interest in the burial-grounds, said in the course of an inflammatory speech on March 13th: 'The vehicle employed to convey plague patients to the hospital was regarded as a hearse brought to the door of one's house to take away the dead. Mothers whose ill and suffering children were taken away from them would become frantic and sacrifice their lives; men's frenzy would turn them into fanatics; they would lose control over themselves. How could a husband be expected to tolerate the sight of his wife's hand being in the hand of another man? From the vans or carriages for the sick patients were taken out and thrown down upon the floor of the hospital as if they were so many pieces of stone. Moreover in the hospital one could not say his prayers so many times a day; one would be made to drink spirits."

"The last argument of all was one urged by a street orator, who insisted that segregation was contrary to the principles of Islam."

**History of the opposition and of the means taken to overcome it. Petition to His Excellency the Governor.**

It was some time before the Konkani Sunnis became at all reconciled to the orders of the Government or consented to assist in carrying them out. They first presented a petition to the Governor of Bombay. His Excellency replied on the 24th of March that it was evident that the petition had been drawn up under a very serious misconception of the objects the Government had in view in appointing the Committee, and of the manner in which it was proposed to attain them. These objects and methods were then carefully explained. On the same day a deputation of the Konkani Sunnis waited on General Gatacre and protested against house-to house visitation and segregation of the sick in hospital. General Gatacre replied that the circumstances made it impossible to permit any attempt to segregate the sick in their own houses. After a protracted discussion the deputation accepted this view, and consented to provide hospitals and segregation accommodation for their community. But on the 2nd of April a mass meeting of the opposition party was held

**Deputation to General Gatacre.**

**Mass meeting**

in the hall of the Jama Masjid at which several resolutions were passed, of which the following was the first and most important :— in the Jama Masjid.

"This meeting declares that all sane and intelligent Sunni Muhammadans are ready at all times to obey Government orders not in conflict with their religion, but they can neither agree to, nor aid and abet in, the forcible removal of the sick to the hospital, and his compulsory separation from all or some of the members of his family with whom he used to live together, owing to its being directly opposed to their Sunni Muhammadan religion." A protest and a copy of the resolution was then forwarded to the Plague Committee.

General Gatacre replied, and, with reference to the first resolution, quoted above, remarked that removal to a public or private hospital was no hardship, and was necessary in the interests of the community at large; also that there was no compulsory separation from the family, as all or any of the members of the family were encouraged to accompany the patient. "Finally," to quote General Gatacre, "the Chairman of the (Plague) Committee addressed a general meeting of the Anjuman-i-Islam, assembled by the Honourable Mr. Justice Tayabji and explained to them once for all that the orders of Government on the subject would be unflinchingly carried out, whatever might be the consequences, and at the same time dispelled the notion which some mischief-makers had put into their heads, that the preventive measures which the Committee were taking were opposed to the spirit or practice of the Muhammadan religion." General Gatacre's reply to the resolution of the meeting. General Gatacre's address to a meeting of the Muhammadan community.

At the same time the Plague Committee issued and circulated widely a manifesto explaining the nature of their arrangements and the reasons for enforcing them, and exposing the misrepresentations that had been disseminated. Proclamation issued by the Plague Committee.

Once the operations of the Committee were in full force the opposition quickly subsided and was replaced by a willing assistance and a spirit of self help. This change is, in the first place, to be attributed to the help given by the Justices of the Peace and other influential members of the Muhammadan and Hindu communities who by associating themselves with the conduct of the operations, by providing hospitals and segregation accommodation for their brethren, and by explaining to the more ignorant what was really being done and the reasons why it was being done, gradually restored a feeling of confidence. Subsidence of the opposition. Help given by influential native gentlemen.

In the second place, the change is to be attributed to the tact, patience, and unremitting attention of the Plague Committee. The account of the work of the Committee which was fully recorded in the local newspapers shows how day by day they conferred with the Tact and patience of the Committee.

leaders of the various communities, encouraged them in their efforts, helped them to select sites for their hospitals, and assisted them in their attempts to detect all cases of the disease and to provide for those who were attacked by it.

## General Remarks on the Operations of the Committee.

General Gatacre's report.

The following description of the work of the Committee is mainly derived from the interesting report prepared by General Gatacre. The passages marked with inverted commas are extracts from General Gatacre's account.

General features of the system.

Broadly it may be said that the system followed by the Plague Committee differed from that previously in force in the city by enlisting the help of the people themselves to a larger extent, by providing for the more certain detection of cases of the disease, by the removal of all patients to hospital, by the provision of largely increased public and private hospital accommodation, and by the more systematic evacuation for purposes of disinfection of all infected houses or rooms.

Divisions of the subject.

It will be convenient to describe the operations under the following main heads:—

(1) Organisation.

(2) Detection of cases and removal of patients to hospital.

(3) Treatment of the sick in hospital.

(4) Disposal of corpses.

(5) Segregation of persons likely to be infected.

(6) Disinfection of houses and articles.

(7) General sanitary measures.

## Organisation.

Division of the city into ten districts.

The first step taken by the Committee was the division of the city into ten districts, due regard being had to the density of the population and the number of houses in each. Each of these ten districts was placed in charge of a responsible medical officer, styled the District Medical Officer of Health. In most of the districts the officer in charge was a Commissioned Medical Officer of the Indian or Army Medical Service.

District Medical Officers of Health.

Duties of these officers.

The following were the main duties of the District Medical Officers. General superintendence and sanitary supervision of the district; supervision of the working of the district hospitals; supervision of the work of the search parties; control of the disinfection of infected areas and buildings; inspection of segregation camps; notification to the officer appointed by the Government of all insanitary premises discovered in the district; reporting on the registration of burials and cremations, and supervision of the sanitary condition of cemeteries. The District Medical Officers submitted a daily report to the Plague Committee, narrating the events of the past twenty-four hours, and making any suggestions they had to offer.

The ten districts.

The ten districts into which the city was shown in different colours in the map on page 7 of Volume IV, and the quarters of the city contained in each district are also given. The following is a list of the districts:—

| Quarters of the city contained in the District. | Population. | Houses. |
|---|---|---|
| *District No. I.* | | |
| ber Colaba ... ... ... ... .. | 4,335 | 164 |
| ver Colaba ... ... ... ... ... | 13,622 | 1,194 |
| TOTAL ... | 17,957 | 1,358 |
| *District No. II.* | | |
| , South ... ... ... ... ... | 3,051 | 469 |
| , North ... ... ... ... ... | 32,847 | 1,165 |
| lanade ... ... ... ... ... | 10,064 | 458 |
| TOTAL | 46,862 | |
| *District No. III.* | | |
| Mandvi | 37,595 | 1,615 |
| Chakla | 32,197 | 1,030 |
| Umarkhadi | 52,468 | 1,784 |
| Dongri | 30,317 | 1,054 |
| TOTAL | 152,277 | 5,483 |

| Quarters of the city contained in the District. | Population. | Houses. |
|---|---|---|
| *District No. IV.* | | |
| Market ... ... ... ... ... | 44,751 | 1,724 |
| Bhuleshwar ... ... ... ... ... | 38,363 | 1,331 |
| Khaiatalao ... ... ... ... ... | 27,035 | 720 |
| Kumbharwada ... ... ... ... ... | 32,209 | 914 |
| TOTAL ... | 142,358 | 4,689 |
| *District No. V.* | | |
| Dhobitalao ... ... ... ... ... | 39,945 | 1,620 |
| Fanaswadi ... ... ... ... ... | 24,069 | 1,146 |
| Girgaum ... ... ... ... . | 26,999 | 1,280 |
| Chowpati ... ... ... ... ... | 11,512 | 902 |
| TOTAL ... | 102,525 | 4,948 |
| *District No. VI.* | | |
| Kamathipura ... ... ... ... ... | 20,203 | 1,344 |
| First Nagpada ... ... ... ... .. | 11,133 | 245 |
| Second Nagpada ... ... ... ... . | 18,768 | 545 |
| TOTAL ... | 50,104 | 2,134 |
| *District No. VII.* | | |
| Walkeshwar ... ... ... ... ... | 12,970 | 1,365 |
| Mahalakshmi ... ... ... ... ... | 17,014 | 1,279 |
| TOTAL ... | 30,004 | 2,644 |
| *District No. VIII.* | | |
| Khetwadi ... ... ... ... ... | 28,814 | 1,270 |
| Byculla ... ... ... ... ... | 47,493 | 1,307 |
| Tardeo ... ... ... ... ... | 18,980 | 711 |
| TOTAL ... | 95,107 | 3,288 |
| *District No. IX.* | | |
| Mazagon ... ... ... ... .. | 33,640 | 1,946 |
| Tarwadi ... ... ... ... . | 21,298 | 1,159 |
| TOTAL .. | 54,938 | 3,105 |
| *District No. X.* | | |
| Parel ... ... ... ... .. | 28,740 | 1,229 |
| Siwri ... ... ... ... . | 6,063 | 880 |
| Sion ... ... ... ... .. | 19,601 | 2,318 |
| Worli ... ... ... ... .. | 25,493 | 2,296 |
| *Mahim ... ... ... ... .. | 18,505 | 2,912 |
| TOTAL .. | 98,402 | 9,625 |

Subdivision of districts.

The districts were further divided into subdivisions, usually under the charge of an officer selected from the medical practitioners of the city. The inspectors and disinfecting staff already working under the Health Department of the Municipality were, after the introduction of the new organisation, directed by the District Medical Officers, the same plan being adopted with regard to the extra men working under the Drainage Department. The staff was also largely increased. A number of Justices of the Peace and other influential gentlemen assisted in the work in each subdivision in a manner that has already been alluded to and will be described in greater detail hereafter. The following is a statement of the total staff of the districts, apart from the hospital staff, and the lady doctors and other ladies who assisted in the house-to-house visitation, etc. :—

Staff.

Justices of the Peace.

Total staff.

| | |
|---|---|
| Subdivisional medical officers ... ... ... | 25 |
| Justices of the Peace ... ... ... | 115 |
| British non-commissioned officers ... ... | 3 |
| British soldiers ... ... ... ... | 10 |
| * Military sepoys ... ... ... ... | 518 |
| * Police sepoys ... ... ... ... | 158 |
| Ambulance sepoys ... ... ... ... | 35 |
| Inspectors of health, disinfection, etc. ... ... | 15 |
| Sub-inspectors ... ... ... ... | 133 |
| Clerks ... ... ... ... ... | 38 |
| Time keepers ... ... ... ... | 17 |
| Watchmen ... ... ... ... | 38 |
| Overseers ... ... ... ... | 62 |
| Labourers ... ... ... ... | 2,035 |

Aid afforded by the military.

General Gatacre makes the following remarks on the subject of the aid afforded by the military: "Owing to the terrifying effect the heavy mortality from plague produced on the lower classes of natives in Bombay, it was almost impossible to procure servants of any description to serve in plague hospitals; and when procured, tempted by the high rates of wages offered, their stay was most uncertain. It constantly happened that men joining the hospital for duty only remained for a few hours. The constant change in menial staff thus caused gave much extra trouble to the medical officers concerned, and was most detrimental to the well-being of the patients. With the sanction of His Excellency Lieutenant-General Sir Charles Nairne, K.C.B., Commanding the Forces, Bombay, the services of troops in the Bombay District, both British and

* Number of officers not stated.

native, were placed at the disposal of the Bombay Government, and, in response to the call for volunteers, officers and men sent in their names *en masse*. Henceforward wherever and whenever in the presidency assistance was required to assist in house visitation, to work . . . . in the hospitals as clerks, storekeepers, ward orderlies, dressers, cooks, orderlies, or to draw the spring ambulances, parties of sepoys were detailed for these purposes and placed on permanent duty in the district in which their work lay."

**Military staff.**

The total number of troops employed in the city was—

*British.*

| | |
|---|---|
| Officers ... | |
| Non-commissioned officers | |
| Men ... ... | |

*Native.*

| | |
|---|---|
| British officers ... | 4 |
| Native officers .. | 11 |
| Non-commissioned officers | 29 |
| Men ... ... | 537 |

**Native soldiers chiefly employed.**

Native soldiers were employed in preference to English soldiers. "The reason of this was, *first*, that the European garrison of Bombay is small and is very fully occupied with guard and other duties, and, *secondly*, that in works which take the British soldier into native houses there is always a risk owing to his absolute ignorance, in most cases, of the language and habits of natives, of a misunderstanding arising which may lead to serious offence being given where none is intended." The Justices also "worked more freely and happily with men of their own race than with European soldiers."

**Clothing, arms, sanitary precautions.**

The soldiers were clothed in a working dress of blue drill with putties; they wore no side arms, and, except in the cases of large detachments posted at distant points in No. X District (the large northern district), their rifles were left in regimental charge. Careful precautions were taken to protect the soldiers from infection. They were segregated in tents or huts situated close to their work. A cot was given to each man to keep him off the ground. Clothes were changed on return from plague duty, the working parties were inspected each day by a medical officer, and a set of careful instructions was issued with regard to the sanitary and other precautions to be observed. Eleven deaths from plague occurred among the sepoys.

**Cordiality between the military staff and the civil population.**

General Gatacre states that it was "gratifying to note the extreme cordiality that existed throughout the whole period during which the troops were employed between the military on duty and the civil population. Every kindness, consideration and civility were shown to the people by the men; this was thoroughly appreciated, and the

result was the entire absence of complaint; no difficulty was experienced by European soldiers or sepoys employed in searching or on disinfection duty."

Detailed account of No. X District.

The detailed working of the organisation is explained in Chapter VI of General Gatacre's report, which describes the work done in No. X District.

Equipment of the district.

The following statement shows the general equipment of each sub-division of the district:—

(1) A temporary plague hospital (the size of which was regulated by the number of inhabitants) with quarters for the medical nursing and menial staffs, and also for segregating the relatives of patients.

(2) A subdivisional office.

(3) A temporary barrack for a military detachment.

(4) Conductors of search parties, such as Justices of the Peace, and other gentleman who volunteered for the work of house-to-house visitation.

(5) A subdivisional staff, comprising a subdivisional medical officer, a clerk, medical subordinates, nurses, ward-orderlies, military and police sepoys for search work, hospital servants, sanitary staff for disinfecting, workmen for building, demolishing, limewashing, and other purposes, coolies for conveying ambulances, an office peon, and police *ramosees for watch work.

(6) Hand ambulances on bicycle-shaped wheels, with india-rubber tyres, and stretchers attached.

(7) A locksmith, or bunches of keys, for opening up locked houses.

(8) Pails, mops, engines, reels, hand pumps, and all other appliances and tools necessary for disinfecting, building, demolishing, digging, burning, limewashing, etc.

(9) A stock of disinfectants, jars for holding solutions, and kettles for holding small quantities.

(10) Complete hospital equipment according to a scale drawn up with reference to the size of hospital.

(11) Arrangements for supplying hospitals with daily provisions, stores, ice, etc.

(12) Arrangements for disposal of unclaimed dead bodies.

(13) Arrangements for discharging patients on recovery in as antiseptic condition as possible.

(14) The provision of a bullock carriage, when necessary, for conveying the relatives of patients to the hospital segregation rooms.

(15) Provision of leather shoes for all servants on plague hospital work who would otherwise be barefooted.

**Description of the district.**

The district was in charge of Surgeon-Captain Jennings. It was an extensive but comparatively sparsely populated district, and comprised the whole northern half of the island. It included the quarters of Mahim, Worli, Sion, Parel, and Siwri. The total population of these quarters of the city is over 98,000, or about one-eighth of the total population of Bombay, and the number of houses is approximately 9,600 or about one-quarter of the total number of houses in Bombay.

**Subdivision.**

The district was divided into four subdivisions, namely, Parel, Sion, Mahim, and Worli. Each subdivision was provided with a complete organisation and establishment for the purpose of detecting plague cases, removing them to a temporary hospital and there treating them, providing accommodation for the relatives of the sick, disinfecting infected quarters, and attending generally to the sanitary condition of the locality.

**Subdivisional staff.**

"The subdivisional medical officer, as a rule, was the visiting medical officer to the subdivisional hospital. He held himself available each morning to assist search parties in diagnosing cases, and to issue detailed directions as to disinfection of infected quarters, destruction of suspicious articles, etc. He visited houses periodically in the subdivision to inspect them as to their fitness for human habitation and as to the condition of their water connections, making notes of his observations. He also made notes of all sanitary defects in the subdivision, and submitted a weekly report of such work to the District Medical Officer, who periodically inspected the subdivision with him in order to see for himself such matters as required action.

"The subdivisional clerk was responsible for submitting all returns regularly; for receiving and despatching reports of conductors of search parties, for keeping hospital accounts, for preparing indents for disinfectants, stationery, and other requisites; for keeping time of employés, and preparing the pay-sheets of all employés in the subdivision who were paid by the Plague Committee, and nominal rolls of all who worked in the scheme.

"Of the rest included under the heading of subdivisional staff, medical subordinates, nurses, ward coolies, ward orderlies (military sepoys), police ramosees (watchmen), and hospital servants, all constituted the hospital staff and did the duties usually assigned to such appointments.

"The military detachments were for the purpose of providing sepoys to accompany conductors of search parties, and were located near the hospitals so as to constitute incidentally additional protection.

"The sanitary staff was the usual municipal sanitary staff of the district, placed at the disposal of the District Medical Officer, and augmented according to requirements.

"The workmen were taken on temporarily and placed under an experienced inspector, who divided them into batches under sub-inspectors for each subdivision; and their duties were lime-washing, erecting huts, demolishing insanitary structures, tile-turning and digging up of floors."

## DETECTION OF CASES AND REMOVAL OF PATIENTS TO HOSPITALS.

House-to-house visitation.

In addition to the death registration and report rules, the main agency employed for detecting cases of plague was the system of house-to-house visitation. This most important portion of the operations was carried out under the superintendence of the Justices of the Peace, of whom, it has been stated above, one hundred and fifteen were employed in the different districts of the city. The number of Justices was augmented by appointing other citizens of influence to be special constables for the purpose of assisting in the work. The Justices were also appointed to be special constables. The importance of the aid thus afforded by the Justices can scarcely be over-estimated. The immediate detection of all cases must lie at the root of any successful organisation against plague; no scheme can be successful that leaves undiscovered cases of the disease to spread the infection. It was essential that the house-to-house visitation should be carried on under the superintendence of men in whom every reliance could be placed, and the fact that the gentlemen employed in the work were citizens of influence, whom the poorer members of the community were accustomed to trust, had the greatest influence in removing opposition and inducing the population to submit patiently to the necessary invasion of their homes. General Gatacre considered that the house-to-house visitation could not have been successfully carried on without the important help given by the Justices and special constables.

Justices of the Peace.

Importance of the aid afforded by the Justices.

Lord Sandhurst's speech to the Justices.

The period of the Justices' assistance was inaugurated by a speech delivered on the 24th February by His Excellency Lord Sandhurst. In the course of this speech His Excellency invited the Justices

of the Peace to assist in the operations that were being conducted, especially in the matter of house-to-house visitation. A large number of the Justices came forward and offered their services in response to this appeal. Before the work commenced, a meeting was held in each district at which the Plague Committee, the District Medical Officers, and the Justices conferred and the method of procedure was explained. Each Justice was at the same time given a sheet of instructions.

Inauguration of the work.

Description of the method of house-to-house visitation.

The following account of the manner in which the house-to-house visitation and the removal of patients was conducted is derived from General Gatacre's report:—

"Meeting at 7 A.M. each morning at the nearest sub-divisional office—each Justice was supplied with the following staff:—

1 Sub-Inspector belonging to the disinfecting staff.
3 Military sepoys.
2 Police sepoys.
1 Locksmith.
1 Ambulance and ambulance sepoys.

"The Justice, after signing the book to notify his presence, proceeded to the locality selected for the morning's visitation.

"If possible, he was accompanied by the subdivisional medical officer of the district and, when the quarter was Muhammadan, by a lady doctor.

"The houses in each street were systematically searched down one side and up the other; no exceptions were made, all alike being subjected to the same rigid inspection.

"On arriving at a house, sepoys were stationed at all the entrances to prevent persons leaving before the inspection was completed; the search party then entered the building.

"Each room, landing, passage, loft, every nook and corner was thoroughly investigated; owing to the exodus that had taken place from the city, a large number of rooms, dwelling-houses, shops and warehouses were found locked up, the owners having fled and left their property behind them. None of these places were overlooked. All were opened and examined in the presence of a police sepoy, who saw that no unnecessary damage was done to property and that the premises were securely fastened after the search had been completed.

Concealment of cases.

"A considerable amount of ingenuity was exercised in the concealment of cases. Patients have been found hidden under bedding and under bundles of clothing, and friends have even gone so far as to lock their sick up in large wooden chests when the search-parties were expected, in the hope that they might thus elude their vigilance. A favourite device was for the patient to assume an air of great activity; he would be found so busily engaged in his work that he

had not time even to answer questions put to him. In the case of women, the sick were frequently come upon grinding corn and singing energetically, but the tell-tale, anxious, haggard face, and the suffused eyes would arouse suspicion, and upon examination the diagnosis was often confirmed by high temperature and enlarged glands.

"On one occasion a Justice entering the house of a dhobi was told there were no sick on the premises; this apparently was the case, the only people present being busily engaged in ironing clothes, and the remaining available space being taken up with piles of clothes. Happening to notice what was apparently a movement among the clothes, the Justice further investigated the matter and found, to his surprise, that an old man (a dhobi) was concealed under the pile. On being removed and examined, he was found to be in an advanced state of plague.

"On another occasion a search-party visited a room occupied by a whole family and found apparently nothing wrong; on the usual enquiries being made, all protested there had been no sickness in the place. The Justice when leaving observed a chair in the corner of the room covered with a cloth which had been thrown over it. On pulling the cloth aside, an old woman was disclosed huddled up between the legs of the chair, also in an advanced state of plague.

"Other cases of concealment, such as persons being shut in boxes, in lofts, and in privies, were constantly being brought to light and even corpses have been made to simulate life, to avoid the inevitable disinfection of the premises.

"Whilst making these visitations every care was taken to respect the customs and caste prejudices of the different communities; before examining the house of a Muhammadan, the rule was to request the owner of the house to assemble the ladies of his family in a room apart, where the lady doctor could examine them, while the other members of the party were carrying out their inspection of the premises. A like consideration was shown in regard to the religious prejudices and observances of all other castes and communities. This fact was soon generally recognised and appreciated by the people and, as a result, a cheerful and ready willingness to second the efforts of the searchers took the place of the passive resistance met with during the earlier days.

Respect paid to the feelings of the people.

"On finding a sick person—a suspicious case—the medical officer was called on to certify as to whether it was a case of plague or not; if diagnosed as plague, the ambulance was brought to the door of the house and the stretcher to the room of the sick person if the width of the door-way or the incline of the staircase permitted of this being done.

Removal of the sick.

"The friends and relatives of the patient were then consulted as to the patient's wishes in regard to a hospital, and, if the person was a caste Hindu or Muhammadan, he or she was invariably sent to the hospital of the caste or sect.

"The patient having been carefully placed on the ambulance stretcher, it was lifted on to the ambulance and the vehicle sent off to the hospital in charge of a military sepoy accompanied on some occasions by two police sowars when the removal took place from a crowded Muhammadan quarter."

At 10-30 or 11 A.M. the Justice and his party returned to the subdivisional office and filled in a certificate of the work done. In the certificate the number of houses visited and the number of cases and deaths of plague discovered were entered.

As an example of the result of the work it may be noted that over four hundred cases were detected in No. X District and sent to the subdivisional or other hospital.

**Ambulances.**

Special attention was bestowed on the ambulances used to carry the sick to hospital with a view to minimize the risk of the transit. Sixty-three special ambulance vehicles were constructed on one of two plans. The ambulances were light and small and designed to carry one person in a recumbent position. The framework was of iron, supported on springs. The wheels were either bicycle-wheels, or specially prepared light iron wheels with rubber tyres. A covering for the protection of the patient was supported on a light framework. The ambulance was drawn by hand.

## TREATMENT OF THE SICK IN HOSPITAL.

**General features and aims of the hospital system.**

Having described how the cases of plague were detected and the patients removed, the next point to notice is the arrangements made for their treatment in hospital. The most noteworthy features were the large number of well-equipped hospitals that were established and maintained, and the efforts made to overcome the reluctance of the population to the hospital system by the establishment of numerous private hospitals.

General Gatacre states that "the aims of the Committee were directed to procure such situations for the hospitals that the removal of patients to them from any part of a district should not involve too great a distance, to add the fatigue of transport *to the dangers of the disease*; that the patients should be placed under every possible advantage of modern skill and knowledge, and that the position of the hospitals should ensure air, healthy surroundings, convenience of water-supply,

and other important hospital and sanitary details, while giving every consideration to the health and sentiments of the people in the neighbourhood." Three large Government plague hospitals, the Arthur Road Hospital, the Grant Road Hospital, and the Parel Government House Hospital, had been established before the appointment of the Committee, and by the middle of January six private hospitals were in use and two more were in course of preparation. Under the auspices of the Plague Committee the hospital accommodation was largely and rapidly increased. By the end of March eighteen hospitals were ready, and finally fifteen Government hospitals and twenty-nine private hospitals were established, giving a total of forty-four.

**Rapid establishment of fresh hospitals by the Committee.**

The fifteen Government hospitals were designed to contain a total number of about six hundred and eighty beds. The following is a list of the Government hospitals:—

**The fifteen Government hospitals.**

| Number of hospital according to General Gatacre's report. | Name of hospital. | Number of district in which hospital situated. | Approximate number of beds in hospital. | Number of cases treated. |
|---|---|---|---|---|
| 1 | Pilot Bandar ... ... | I | 10 | 34 |
| 2 | Jamsetjee Bandar ... ... | I | 10 | 33 |
| 3 | Modikhana ... ... | II | 20 | 18 |
| 4 | Charni Road ... ... | V | 40 | 70 |
| 6 | Grant Road ... ... | VI | 80 | 401 |
| 6-A | Police ... ... ... | VIII | 60 | 28 |
| 8 | Wari Bandar ... ... | IX | 40 | 56 |
| 9 | Narialwadi ... ... | IX | 20 | ... |
| 10 | Reay Road ... ... | IX | 20 | 22 |
| 14 | Arthur Road ... ... | VIII | 60 | 321 |
| 15 | Parel ... ... ... | X | 200 | 304 |
| 16 | Sion ... ... ... | X | 40 | 67 |
| 17 | Mahim Causeway ... ... | X | 40 | 90 |
| 18 | Worli ... ... ... | X | 20 | 44 |
| 19 | Jullaia Muhammadan ... | VIII | 20 | 50 |
| | TOTAL ... | ... | 680 | 1,538 |

NOTE.—No hospitals were established corresponding to numbers 5, 7, 11, 12 and 13.

The figures in the above statement are taken mainly from the detailed reports on hospitals contained in Chapter II of General Gatacre's report.

In some districts it was found necessary to establish hospitals in several subdivisions, and some of the more crowded and smaller districts in the centre of the city were served by the hospitals of adjoining districts. This was usually the case when a convenient site could not be found in the district itself.

The Parel Hospital was much the largest; it was used for cases of plague discovered among persons entering Bombay by road *viâ* the Sion Causeway, and by the Great Indian Peninsula Railway, and for No. X District. The next largest hospitals were the Grant Road Hospital, the Arthur Road Hospital, and the Police Hospital. The latter was used exclusively for the police force. The Grant Road Hospital was in a very central position and was used both for No. VI District, and for surplus cases from the surrounding districts. The Arthur Road Hospital is a permanent municipal hospital. It served a portion of No. VIII District.

**The twenty-nine private hospitals. Distribution among districts.**

The private hospitals were mostly congregated in the central and densely populated portion of the city. Their distribution among the districts was as follows:—

| | |
|---|---|
| District No. II | 3 |
| „ „ III | 9 |
| „ „ IV | 4 |
| „ „ V | 2 |
| „ „ VIII | 5 |
| „ „ IX | 3 |
| „ „ X | 1 |

The position of the remaining two private hospitals is not stated.

**Distribution among communities.**

The following is a list of the communities and other bodies for whom the private hospitals were established:—

| | Number of hospitals. |
|---|---|
| European | 1 |
| Servants of Europeans | 1 |
| Port Trust employés | 1 |
| Muhammadan (general and particular communities) | 6 |
| Memon (Muhammadan religious sect) | 3 |
| Khoja (a sect of Muhammadan converts) | 2 |
| Borah (a sect of Muhammadan traders) | 3 |
| Mogul | 1 |
| Gojari (Gujarat traders) | 1 |
| Hindu (general) | 8 |

| | Number of hospitals. |
|---|---|
| Marwari (Hindu trading caste) ... ... | 1 |
| Bhatia (Hindu trading caste) ... ... | 1 |
| Bannia (Hindu trading caste) ... ... | 3 |
| Parsi ... ... ... ... | 1 |
| Jain ... ... ... ... | 2 |
| Telugu ... ... ... ... | 1 |

The European hospital was the St. George's Hospital, situated in No. II (Fort and Esplanade) District; 95 cases were treated there. The biggest of the private hospitals were the General Hindu Hospital (District No. IX) in which 331 cases were treated, and the Jain Hospital (District No. VIII) (206 admissions). In the 23 private hospitals, with respect to which details are given in Chapter II of General Gatacre's report, the number of admissions was 1,244.

**Usefulness of private hospitals.**

General Gatacre stated that the moral and practical support which the Committee received from the establishment of private hospitals was invaluable, as it quelled at once the misgivings and fears entertained by the people with regard to the hospital system.

**Hospitals for individuals and families not allowed.**

The Committee insisted that the private hospitals should be open to all the members of the caste or sect for which it was established and declined to sanction any applications for hospitals for private individuals or for groups of private individuals.

**The multiplication of hospitals caused no spread of the disease.**

At the outset some persons entertained misgivings that "the multiplication of plague hospitals in the city and their location in thickly populated quarters would cause virulent centres of infection, which would be a source of greater danger than the alternative of treating the sick persons in their own houses. This important question was keenly discussed and considered, but the Committee adhered to its decision that the private hospital system would meet the requirements of many who by reason of caste or custom would not have gone to hospital under any circumstances without forcible removal. Accordingly, applications for private hospitals were sanctioned on the distinct understanding that all arrangements in connection therewith would be carried out by a hospital board, and that the medical attendants and staff should be under the supervision and control of the medical officer of the district in which the private hospital was located; and this officer was made responsible for compliance with the orders of the Committee. The results of the system fully realised the convictions of the Committee, and the opinion, generally expressed in many quarters, that the private hospitals would be a further source of danger to the city proved erroneous; the careful supervision maintained by those in charge of these institutions secured the result that in no single instance

was the disease spread by the proximity of a plague hospital to other dwelling houses, and notably there was an example in the Khoja Hospital in Tantanpura Street, which had a number of patients and was next door to an orphan school in which none of the children suffered from plague."

**Construction and equipment of Government hospitals.**

The following account of the plan of construction and general arrangements of the hospitals is of great interest:—

"A scheme of hospital organisation was proposed and a standard plan of hospitals was designed, a special equipment of staff, stores, furniture, and appliances, being drawn up on a ready basis, suitable to any pressing demands.

**Standard plan.**

"In designing the hospital, a section was taken as the unit; this held 20 beds in an area of 120 feet × 24 feet, giving each bed a superficial area of 144 square feet—a somewhat liberal provision; but bearing in mind the necessity for attendance of one or two relatives with the patient and looking to the fact that a large cubic space of fresh air favourably influences the progress of recovery and lessens the possibility of contagion, it was determined by the Committee to adhere to the above measurements. Subsequently it was found convenient to build half-section hospitals (10 beds) and quarter-section hospitals (5 beds) in districts where few cases were anticipated.

"The standard adhered to, however, was that of a one-section hospital, and to it was apportioned its standard equipment, so that on an order being issued by the Committee for the institution of a hospital of any proportion, the District Medical Officer had merely to follow the orders laid down on the subject for a hospital of the size indicated. This saved much delay in ordering staff, stores, etc., for any hospital, more especially at outlying stations. Copies of the plan and equipment of a one-section hospital were accordingly issued to the various executive departments of the Committee and to all contractors, with directions to regulate the construction of buildings and the supply of stores, medicines and furniture accordingly.

"As will be noticed by referring to plan No. 4* attached to the appendices of this report, the hospital was enclosed in a ring fence constructed of bamboo matting fixed on bamboo uprights.

"The plan No. 4* shows a one-section hospital and is designed to fit into the smallest area possible, *viz.*, 140 feet × 160 feet, but wherever more room was available, advantage was taken to spread the buildings over more ground.

"The two wards for males and females were placed at the end of the site further from the enclosure gate, and the accommodation for families of patients was built near the door as far from the

* Reproduced on a reduced scale, Volume IV, page. 13.

actual hospital as possible; the arrangement shown was adhered to, as far as feasible, in all Government hospitals.

"All hospital buildings were constructed of the lightest and cheapest materials compatible with safety. The posts and framing were of bamboo or benteak set well into the ground on a 12-inch plinth; the sides were of single bamboo matting; the roof of two thicknesses of jowli or cadjan (plaited palm leaf in general use in tropical countries); the latter in some instances lined inside with cloth. The whole hospital, inside and out, except the roof, was limewashed at intervals.

"The cook-houses were constructed of corrugated iron, both roof and sides, on wooden framing.

"Drinking-water was drawn from two or more taps to meet the wants of the various castes.

Sanitary arrangements.

"As regards sanitary arrangements, the privies were on the dry system, the night-soil being removed by hand after being disinfected with perchloride of mercury or carbolic acid; a washing place, with one or more taps, with a paved space around it, was always provided in a convenient position, and from that and the bathrooms in connection with the nurses and hospital assistants' quarters and the various cook-houses was led a small open drain constructed of 4-inch stoneware pipes cut in half and laid on concrete, connected either with cesspools or the nearest available drain.

"It has generally been found convenient to supplement the buildings shown on the plan by a general cook-house for the wards, and an extra bathroom for nurses' quarters; in some hospitals which were continually full, a dispensary and office were also given, otherwise a corner of one of the wards was made use of for this purpose. It was also found desirable to place a width of rabbit wire-netting round the lower walling of the mortuary, or to supply a wire bier cover to prevent dogs interfering with corpses lying therein; the mortuary was, wherever practicable, placed well away from the hospitals and quarters.

"The cost of the buildings above described averaged annas 6 per square foot of area covered; the arrangements and style were found to be eminently successful and the generality of Government hospitals were much cooler than those of private hospitals located in permanent buildings.

Staff.

"The staff of a one-section hospital was fixed as follows:—

| | |
|---|---|
| 2 Nurses. | 1 Bheesty.* |
| 1 Ayah. | 2 Sweepers. |
| 1 Hospital Assistant. | 2 Nurses' servants. |
| 4 Ward Orderlies. | 1 Hospital cook. |

Water carrier.

"If there were many severe cases, it was found necessary to supplement the staff with an extra nurse, to increase the number of ward orderlies, and when the caste and other conditions of the patients required it, the number of cooks also."

The fourteen Government hospitals that were in active work contained 32 sections. According to scale this would give 64 nurses and 32 hospital asistants.

**Construction and equipment of private hospitals.**

In private hospitals the arrangements were not on so regular a plan as in the Government hospitals, but, as has already been stated, they were controlled by a board and were subject to the approval and supervision of the Committee and the District Medical Officer. As an example, the Cutchi Memon Hospital, which was opened on the 29th March, was established in an existing building. On the ground floor there was accommodation for the relatives who wished to remain with the sick. On the first floor there were separate wards for males, females and children, a dispensary, a cook-room, etc. There was also a convalescent ward. Again the Bohra Hospital was established in a schoolhouse. The building contained three blocks, one of which was used as a hospital and two for segregation purposes. The hospital was furnished with twenty beds and contained room for more. Room was also provided for the relatives of the patients. The persons in the hospital were lodged, fed and nursed free of charge, and arrangements were made to provide the services of a practitioner in native medicine should they be required.

**Precautions against infection in hospitals.**

The following regulations were issued with regard to precautions to be observed against infection in hospitals:—

**Ward attendants.**

"*Ward attendants on the sick.*—Each attendant will be furnished with two suits of ward clothes.

A suit will be put on before going on duty.

On coming off duty, the suit will be soaked in a disinfectant (carbolic, 5 per cent., or perchloride of mercury solution) and dried in the sun.

All the clothing of men about to rejoin their regiment should be disinfected before they leave the hospital compound.

**Patients.**

"*Patients.*—A patient on admission will be undressed and well washed with hot water and carbolic soap. Hospital clothing will be supplied.

All articles not worth preserving will be at once burned under the supervision of some responsible person.

There being no steam disinfector available, clothing of any value should, if of cotton, be boiled for three hours in a 3 per cent. solution

of soft soap in water, or steeped in perchloride of mercury solution before being washed..

Woollen clothes worn by the patient should be burned.

"*Wards.*—The boarded floors should be swabbed twice daily with perchloride of mercury solution. Wards.

The whole of the stone floors will be whitewashed with freshly made limewash at least once a week.

Should any discharge from a patient fall on the floor, it must be at once covered with carbolic powder and swept up. Perchloride of mercury solution should then be applied to the spot, and fresh whitewash applied to the stone floor. Crockery and glassware should be washed in a 5 per cent. solution of carbolic acid before it is allowed to leave the ward.

Beds will be limewashed after a patient's recovery or death; the straw burned, and the bedding disinfected.

"*Excreta.*—A small quantity of some disinfectant, such as carbolic-powder, lime-water, perchloride of mercury solution, or chloride of zinc solution should be placed in each bed-pan before use. After use, the motion should be covered with a similar disinfectant before being taken out of the ward. Excreta.

The solid excreta will be destroyed in the incinerator.

After use, the bed-pans should be scalded with hot water."

As an instance, the following is the description given of the sanitary precautions adopted in the Grant Road Hospital:— Sanitary precautions in the Grant Road Hospital.

"Disinfection consisted in adding perchloride solution 1—1,000 to every excretion, whether evacuations, urine, vomited matter, or suppurated discharges, and as far as possible to pulmonary expectoration. 1—1,000 solution of perchloride of mercury or a 5 per cent. solution of carbolic acid was ever ready in the wards to wash the hands, sponges, or instruments used in connection with cases.

"Rags or linen squares used as dressings or to wipe up excretions and sputa being of no value were burnt.

"Bedding, as sheets, blankets, pillow slips, etc., and clothing were, on being changed, saturated with a one per cent. solution of perchloride of mercury then exposed in the sun till dry and subsequently washed in the ordinary way by a resident dhobie.

"The general latrines for native employés and convalescents were treated twice a day with carbolic-powder. The evacuations received in an iron vessel with deep sides to prevent splash were disinfected with a 1—1,000 corrosive solution and every night conveyed to a special night-soil cart for disposal."

**Medical and nursing staff.**

The following details of the medical and nursing staff in the Government hospitals are mainly taken from the hospital* reports given in Chapter 2 of General Gatacre's Report, and from Appendix 7* of the same report :—

| Number of hospital. | Name. | Number of district. | Medical officers. (c) | Subordinate medical officers. | Compounders. | Nurses. |
|---|---|---|---|---|---|---|
| 1 | Pilot Bandar ... | I | (a) | 1 | 1 | ... |
| 2 | Jamsetji Bandar ... | I | 2 | 2 | ... | 4 |
| 3 | Modikhana ... | II | 1 | 3 | ... | 3 |
| 4 | Charni Road ... | V | (a) | 2 | ... | 3 |
| 6 | Grant Road ... | VI | 1 | 2 | 1 | 16 |
| 8 | Wari Bandar ... | IX | (a) | 2 | ... | 3 |
| 9 | Narialwadí ... | IX | (a) | 1 | ... | 2 |
| 10 | Reay Road ... | IX | 1 | ... | 1 | 2 |
| 14 | Arthur Road ... | VIII | 2 | 3 | 1 | 7 |
| 15 | Parel ... ... | X | 2 | 3 | ... | (a) |
| 16 | Sion ... ... | X | 1 | 1 | ... | 2 |
| 17 | Mahim Conservancy ... | X | 1 | 2 | 1 | 7 |
| 18 | Worli ... ... | X | 1 | 1 | ... | 2 |
| 19 | Jullaia Muhammadan | VIII | (b) 1 | ... | 1 | ... |

(a) Not stated.
(b) The doctor was a Muhammadan who treated according to the native system of medicine.
(c) The medical officers were either Commissioned Medical Officers or private practitioners.
* The figures in the hospital reports and in the appendix do not in some cases agree; the figures from the reports have been taken.

The following details are taken from the reports of the private hospitals :—

| Number of hospital. | Medical officers. | Subordinate medical officers. | Compounders. | Nurses. |
|---|---|---|---|---|
| 1 | 1 | ... | 1 | 3 |
| 2 | 1 | 1 | 1 | 2 |
| 3 | 2 | 2 | 2 | ... |
| 4 | 2 (*a*) | 1 | ... | 2 |
| 5 | 2 (*b*) | ... | 1 | ... |
| 6 | 1 | ... | ... | ... |
| 7 | 1 | ... | 1 | 1 |
| 9 | 2 | 1 | ... | ... |
| 10 | 1 | 2 | ... | ... |
| 11 | 1 | 1 | ... | ... |
| 14 | 1 | ... | 1 | ... |
| 15 | 2 | ... | 1 | ... |
| 17 | 3 (*c*) | 1 | ... | 2 |
| 20 | 1 | 1 | ... | 1 |
| 21 | 1 | 1 | ... | ... |
| 22 | 1 | 1 | ... | ... |
| 23 | 4 (*d*) | ... | ... | 1 |
| 24 | 1 | 1 | ... | 1 |
| 25 | 1 | ... | 1 | 2 |
| 26 | 2 | ... | ... | ... |
| 27 | 1 | ... | ... | ... |

(*a*) Also a lady doctor. (*b*) One of these was a hakim or practitioner in native medicine.
(*c*) Two of these were hakims. (*d*) One consulting officer, two in charge and one for night duty.

There were not many nurses in these private hospitals, but female attendants (ayahs) were employed in almost all cases.

**Difficulty of procuring nurses.**

The nursing staff was a matter that presented some difficulty as there was no considerable permanent staff of nurses on which to draw.

**Aid given by the Roman Catholic convents.**

The difficulty was in the first place met by the help afforded by the Sisters of the Roman Catholic Institutions in Bombay—the convents at Clare Road, Grant Road, and Mazagon.

**Nurses procured in India and from England.**

Nurses trained in India were also procured from different parts of the country, and twelve nurses were brought out from England.

**General supervision of nurses.**

The Reverend Mother Superior, All Saints' Sisters, Mazagon, undertook the duties of the general supervision of the nurses, whilst for all purposes of hospital nursing and discipline they were under the charge of the officer in charge of the hospital or the District Medical Officer.

**Classes and remuneration of nurses.**

The nurses were divided into the classes of Matrons, Senior Nurses, Junior Nurses, and Subordinate Nurses. They were paid according to the following scale :—

| | Rs. |
|---|---|
| Matrons ... ... ... ... | 150 |
| Senior nurses ... ... ... ... | 100 |
| Junior nurses ... ... ... ... | 80 |
| Subordinate nurses ... ... ... | 20 to 30 |

In all cases quarters, food, light, etc. (or an allowance in their stead) were provided in addition to salary. The nurses engaged in England were paid at the rate of Rs. 175 a month.

**Duties of nurses.**

The duties of matrons and senior nurses were as follows :—

The management of servants ; the charge of nurses' messes ; the supervision of all ward arrangements; the supervision of the cleansing of wards, latrines, etc., and of the disinfection of clothes ; the control of nurses, ayahs, ward boys, etc., the disbursement of all petty cash.

The duties of junior and subordinate nurses were as follows : —

To assist the matron generally ; to be responsible during her temporary absence ; to go round with the doctors ; to receive orders and to see to their execution.

**Useful and devoted work of the Roman Catholic Sisters.**

The Sisters from the convents displayed great devotion in the performance of their task. Their care went far to reconcile the people to the hospital system, and several instances are cited in General Gatacre's report to show the usefulness of their ministration and the gratitude which it evoked. One of the Sisters, Sister Elizabeth of the Bandora Convent, died a victim to the plague in the prosecution of her duty. General Gatacre concludes his account of the work of the Sisters in the following passage :—

"The special features of the plague from the point of view of the Sisters who had to deal with it, were the state of filth in which the

majority of the patients arrived, the sickening odour of the buboes, and the violence of the patients, many of whom had at first to be tied down to their beds to prevent their leaping out in an attempt to escape. The fortitude with which the Sisters faced these horrors in the performance of their self-imposed tasks was well rewarded by the triumphs over the prejudices of their patients and by the evidence of the gratitude felt by them. In other measures, necessary and well-managed though they were by the officers in charge of them, taken for the suppression of the plague, the people at large at best gave a silent acquiescence. But the record of services rendered by the Sisters, and the gratitude evoked by them, forms one of the most pleasing pictures in the history of the plague."

Aptitude of the English nurses.

In the report on the Grant Road Hospital it is stated that the nurses from England exhibited great aptitude and intelligence, both medical and surgical, in the discharge of their duties, and were a credit to the hospitals where they had received their professional education.

The Bombay Plague Committee gave similar testimony to the good work done by the lady nurses from England.

## DISPOSAL OF CORPSES.

Sanitary condition of burial-grounds.

In the disposal of corpses the matter principally looked to was the condition of the burial-grounds. It has already been stated that the supervision of the sanitary condition of cemeteries was one of the duties entrusted to the District Medical Officers. A measure of particular importance enforced in this connection by the Government of Bombay was the closure of the Grant Road Muhammadan burial-ground. This cemetery is situated in a densely populated portion of the city, and its overcrowded condition made the continuance of its use, and especially its use for the burial of plague patients, a menace to the health of the population. The cemetery was closed under an order of the Government which was issued under the Epidemic Diseases Act on the 21st April, and new burial-ground in a more suitable situation was presented to the Muhammadan community by the Municipal Corporation.

Closure of the Grant Road Muhammadan burial-ground.

Last rites performed by the relatives.

The actual disposal of the bodies of persons who died of plague was left, as far as possible, to the relatives and friends of the deceased, who performed the last rites according to the custom of

their sect, subject only to such sanitary supervision as was essential.

**General rule for observance in hospitals.**

One of the standing rules for observance in hospitals was that the body should be wrapped in a sheet soaked in perchloride of mercury before being handed over to the friends of the deceased.

**Arrangements in the Grant Road Hospital.**

The following description is given of the manner in which corpses were treated in the Grant Road Hospital:—

"All persons who died were removed to the mortuary and, pending removal to the cemetery, were sprinkled over with carbolic-powder. On removal their bodies were washed with a solution of phenyle and afterwards rolled in a sheet saturated in solution of perchloride of mercury. When friends provided their own burial arrangements for the dead and dressed the body in new clothing, the disinfecting sheet was not omitted. When friends desired a private burial for their dead and had no means to carry out their intentions, money was given them from the Pollen Fund, or they were assisted with money and new clothing from the hospital stock."

**Biers.**

Biers were supplied in each hospital of the district for conveying bodies to the cemetery or burning-ground.

## SEGREGATION OF PERSONS LIKELY TO BE INFECTED.

**Relatives of the sick compelled to evacuate infected rooms and houses and accommodated in segregation near the hospitals.**

Very little is said in General Gatacre's report about the segregation of the persons who occupied the same portion of a tenement or the same house as the sick person, but it is to be gathered that all such persons were compelled to vacate the room or house to allow of its disinfection, and that they were in general segregated in the neighbourhood of the hospital in which the sufferer was being treated. It will be remembered that on the 23rd March an addition was made to the notification appointing the Plague Committee specially authorising the segregation, for a period not exceeding ten days, of the inmates of an infected building. In the public notice issued by the Committee shortly after its formation, the following passage occurs: "When a sick man has been taken away from a room, his family shall also vacate such room and shall take care of and tend the sick man." In the standard plan for Government plague hospitals provision was made, it has already been seen, for accommodating the families of sick persons, and the details of both Government and private hospitals show that a large number of persons were segregated in this manner.

## TREATMENT OF INFECTED AND INSANITARY BUILDINGS.

**Disinfection of houses and their contents.**

The disinfection of the house and of its contents formed the sequel to the Justice's visit. The following is the account given by

General Gatacre of the prescribed procedure :—

"1. Immediately a patient is removed from a room, the disinfecting staff should be ready and brought into operation.

"2. All rags, bedding, clothing of the patient and kutchra* generally should be carefully lifted up and removed and burned outside the building. In placing the articles outside, they should be carefully laid down so as not to raise dust.

"3. No brushing of walls or floor should take place; this is a most dangerous proceeding and is calculated to spread infection.

"4. The first work in all instances is to flood the floor with a solution of perchloride of mercury not weaker than 1 in 1,000, the junctions of floor and walls and all corners should then be mopped with the solution as well as the wall, as far as the mop will reach, and above this a small hand-pump should be used; the floor, if made of earth, should then be dug up to a depth of four inches.

"5. All furniture that can be dealt with should be likewise disinfected with perchloride of mercury solution, either with a pump or with a cloth dipped in perchloride solution.

"6. After the above work has been thoroughly done and the solution has dried, quicklime in a hot state, and in as strong a solution as possible, should be laid on all the walls, floor and ceiling.

"7. In the event of the whole house requiring disinfection, the privies should be attended to at first, not forgetting the shafts, then the staircases and corridors should be operated upon; lastly, the rooms in order, first by washing every part with perchloride of mercury solution and laying on the quicklime as described in paragraphs 4 and 6.

"8. All *nahanis*† and *nahani* pipes should be carefully disinfected by flooding them with perchloride of mercury solution, and where necessary, they should be altogether removed and replaced with new ones at the cost of the owner of the premises.

"In the case of the poor, a small money grant was made them as compensation for articles destroyed. Property, the destruction of which would inflict great loss on the owners, was moved out into the road and left there, exposed to the sun and air for three days, a guard being placed over it. The contents of shops and godowns in which cases of plague occurred were treated in a similar manner.

"Besides the actual disinfection and limewashing of the inside of the houses affected with plague, a steam flushing engine was obtained and the outside of the premises was thoroughly washed down, and the gullies and drains and *nahani* traps well flushed with disinfectants.

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* Refuse. † Drains.

"Where four or more cases had occurred in one house, the place was vacated and was not reoccupied until the District Medical Officer was satisfied that it was free from infection. Where the house was in such an unsatisfactory sanitary condition as to be unfit for human habitation it was vacated, condemned by a sanitary board and marked with the letters U. H. H.* Huts for accommodation of people who were thus turned out of their houses had already been erected in different quarters of the city by the municipality.

"Thus, not only were plague cases discovered by means of house-to-house visitation, and the infection of the diseases controlled and prevented from spreading, but the dark, evil smelling, ill-ventilated, ill-drained, overcrowded lanes and alleys of Bombay were explored and thoroughly cleansed."

## GENERAL SANITARY MEASURES.

**Vigorous measures instituted by the municipal authorities continued after the formation of the Committee.**

The vigorous general sanitary measures prosecuted by the municipal authorities during the early period of the epidemic were not relaxed after the control of plague operations had been entrusted to the Committee. In addition to the thorough treatment of single houses described above, large measures of cleansing and sanitary reform were continuously executed. At one time as many as five thousand special workmen were employed on these operations.

**Statistical statements for work done.**

The following is a statistical statement of the work done on dwellings from the beginning of February up to the end of the first week in April:—

| | | |
|---|---|---|
| Dwellings | condemned ... ... ... | 1,762 |
| „ | recommended for alteration ... ... | 929 |
| „ | from which tiles removed (to let in light and air) ... ... ... | 10,931 |
| „ | in which floors dug up ... ... | 4,370 |
| „ | limewashed ... ... ... | 13,891 |
| „ | vacated ... ... ... | 2,643 |
| „ | destroyed (by fire or otherwise) ... ... | 416 |

**Treatment of dwellings reported to be insanitary by the District Medical Officer of health.**

The reports submitted by the District Medical Officers were of great help in drawing attention to the places requiring cleansing and disinfection. The following passages describing the working of the system are from the editions of the *Times of India* of the 13th March and the 6th April:—

"The permanent work of improvement has been entrusted to Dr. Kirtikar† and to Khan Bahadur M. C. Murzban, C.I.E. The special

* Unfit for human habitation.

† Special Health Officer.

medical officers and Deputy Health Officers appointed in each ward send in the reports of their observations to Dr. Kirtikar regarding the defective construction and insanitary condition of houses; overcrowding of tenants; excessive heights of buildings; insufficiency of arrangements as to ventilation, and of letting in sunlight; bad floors; roofs incapable of affording shelter and shade; ill-planned drain connections; uncontrolled water-taps; ricketty walls, and so forth. The Superintendents and Inspectors in the Municipal Executive Engineer's Department, under Mr. Murzban's charge, send reports to Mr. Murzban of a similar character regarding buildings requiring condemnation or alteration. Then references from Dr. Kirtikar to Dr. Murzban and *vice versâ* ensue. The officers themselves go either to verify or modify the suggestions made in the reports; to approve of the recommendations contained therein; or to enhance the number of alterations already suggested. Then they agree on the points and recommend the Municipal Commissioner to issue certain directions to the owners and occupiers of the tenements. In matters under discussion but awaiting a decision, a reference is made to that officer, who uses his discretion and passes final orders."

The "U. H. H." system.

"With regard to the marking of insanitary huts, sheds, premises, and buildings with the letters 'U. H. H.' in red, the situation is as follows:—It will be remembered that in the notification promulgated by Government about the plague measures, the Plague Committee and the Municipal Commissioner are authorised to remove all insanitary huts, sheds and buildings. Under the Commissioner's instructions, the inspection of buildings was systematically commenced both by Dr. Kirtikar and by Dr. Jennings, the arrangement made with whom was that their reports should be forwarded to Khan Bahadur M. C. Murzban, C.I.E., Executive Engineer to the Municipality, whose department would further inspect the structures reported upon by both the above officers, and if he concurred that the structures in question were fit ones for condemnation, and were unfit for human habitation, a declaration would be made by marking them out in red letters with 'U. H. H.' The people inhabiting such marked dwellings are made to vacate as soon as possible; but not until some short time is given to them as sufficient warning to effect the removal. About the houses which the Executive Engineer's Department deem capable of improvement, orders are given to the owners to have the desired measures carried out. But those that are put down as incapable of improvement are ordered to be pulled down; whereas insanitary huts and sheds are demolished and destroyed. This system continued to work well for some time, when the Executive

Engineer's attention was drawn to the fact that this procedure, if vigorously and rigorously continued very long, was likely to render a large number of people in Bombay houseless and homeless. He thereupon reported the matter to the Municipal Commissioner, who considered the question whether the inspection, improvement, and demolition of the buildings should be continued longer in similar conditions, or should be stopped. The Municipal Commissioner, after consulting, we are informed, the Plague Committee, decided that as the rains were coming on soon, the demolition of buildings should be carried out with greater care. The inspection of the buildings is, however, still going on; but the closing of houses and the marking of them with 'U. H. H.' has so far ceased, unless when the exigencies of the case demand the adoption of this stringent measure forthwith. After the rains, the systematic examination and rejection of unsuitable buildings is expected to proceed, and then all those houses and *pucca** tenements which will be adjudged to be 'U. H. H.' will be subjected either to good sanitary alterations or improvements, or when they are found to be past redemption will be demolished without compunction or concern. It will be seen from this that the popular misconception about the houses being condemned promiscuously and carelessly is undeniably erroneous and without foundation, and that the work is being scrupulously carried out in accordance with the avowed principles of sanitary science. In consideration of the amount of work required to be carried out, the Municipal Commissioner has sanctioned an additional establishment to the Executive Engineer's Department, of one Assistant Engineer, three Divisional Superintendents, and seven ward inspectors for the purpose of conducting the examination of houses on the principles of sanitary engineering science. The whole of this establishment is not, however, to be entertained immediately; but the Executive Engineer is authorised to employ such of the sanctioned men from time to time as occasion requires. It is probable that the full complement of this newly-created staff will be required after the rains, when the strict and systematic examination of buildings and the condemnation of the insanitary ones will be resumed as hitherto."

Mr. Snow stated that up to the beginning of October 1897, the sanitary condition of 2,000 buildings was carefully overhauled in this fashion.

**Cleansing and disinfecting of entire localities. Seven instances.**

Another very important set of operations was the cleansing and disinfection of entire localities which were insanitary or infected to a special degree. General Gatacre gave an interesting account of the operations conducted in certain localities illustrated by a set of

* Masonry.

maps and diagrams which are reproduced in Volume IV, pages 8 to 12 In these accounts an endeavour was made to trace the effect of the operations on the course of the disease.

*Case No. 1. Kamathipura (District No. VI).*—Illustrated by diagram on page 8 of Volume IV. Kamathipura.

"Kamathipura is by virtue of its low-lying position naturally unhealthy and its houses are mostly dark, damp and without ventilation and most of them have been built on reclaimed ground." The locality was the scene of a very severe outbreak. A special gang of 400 coolies worked on limewashing and other cleansing work throughout part of December 1896, and the whole of the following month. The operations were completed about the 10th February. Every house was limewashed to the number of 1,344, and something over 100 tons of fresh hot lime was expended on the work. Dropping plague cases occurred from the end of September, but it was not until the latter end of November that they became indigenous. From the chart it will be seen that up to the beginning of November the cases were probably imported from other parts of the city. The small groups of cases between the 9th and 12th November and the 15th and 26th November, respectively, are considered to have been indigenous. The third and main group occurred between the end of November and the 12th February, and during this period the disease was epidemic. During December and January the population of the district fell to one-half of the normal. The end of the epidemic almost coincided with the end of the cleansing operations.

*Case No. 2. Daji Purbhoo's Wadi at Gharupdeo in Tarwadi (District No. IX).*—Not illustrated. A quarter in Tarwadi.

This locality contains about 90 houses and 2,000 inhabitants. The houses are mostly a wretched class of tenement constructed of mud. They were found to be dark, damp, badly ventilated and surrounded by insanitary conditions: most of the sewage escaping into the ground.

"The first recorded case occurred on January 1st, the second on the 6th, and from that date onwards until the 14th February 21 cases occurred; by that date all the inhabitants had left the Wadi. The usual cleansing operations were carried out, all the houses being mostly thoroughly limewashed, and those in which cases had occurred treated with perchloride of mercury. The water was cut off in all the dwellings and stand-pipes with taps erected from which open drains were constructed, and all kutchra collected and burned.

"The cleansing operations commenced on January 28th and occupied two days and were most thoroughly done.

"After the 29th of January the following cases occurred:—30th, one case; 31st, two; February 2nd, two; 3rd, three; 4th, one; 5th, one; 7th, one; 9th, one; 10th, one; 12th, two; 13th, three; 14th, one.

"This would appear to point out the fact that when the surroundings are hopelessly insanitary and where buildings are overcrowded, as they were in this Wadi, and have little or no plinth, and the rooms contain no means of ventilation, except the door, sanitary operations have little or no effect in stopping the disease, and that the only certain treatment is segregation of the people and demolition of the buildings."

**A quarter in Mazagon.**

*Case No. 3. Amba Wadi in Mazagon (District No. IX).*—Not illustrated.

"In Amba Wadi which is in the Mazagon District, there are about 200 houses containing probably a population of 1,800. The houses are many of them pucca built, rooms fairly dry and light, with ventilation. The first case of disease here occurred as in Daji Purbhoo's Wadi on January 1st; another case was not reported until January 13th and then four are reported: 13th, one; 14th, one; 15th, two. There was then an interval of ten days, the next case occurring on the 28th and two on the 29th.

"On January 21st disinfecting operations commenced and were completed on February 4th. From that date practically no cases occurred although many houses remained occupied."

*Case No. 4. Village of Worli Koliwada* (District No. X).*—Illustrated by plan and diagram, Volume IV, page 9.

**Worli.**

"The events which accompanied the course of the disease in this village are exceedingly interesting. Worli Koliwada is an isolated village on a peninsula in the north of the island; it is inhabited almost entirely by Kolis (fishermen). The number of houses in the village is 936, and the normal population is 5,493. The character of the disease was marked by extraordinary virulence, over 90 per cent. of the persons attacked dying, often after a few hours' illness only.

"The houses are mostly kutcha built† with cadjan‡ roofs, which are in many cases brought down so low as to render the inside very dark. The streets are exceedingly narrow. There is no artificial drainage, but good natural drainage exists from west to east; the whole village is open to the sea breeze on two sides. During the months of October and November 1896 there is no record of any case of plague having been present in the village, the first case being reported on December 1st.

* Fishing village. † Made of mud.
‡ Plaited palm leaf.

"The villagers were fully alive to the dangers of the disease and of its getting into the village, agreed among themselves as far back as October to prevent strangers entering the village, by placing watchmen at the entrances, and to allow no persons to proceed from the village to any infected part of Bombay; they even went so far as to object to the usual municipal coolies visiting the village for cleansing purposes. But all this was of no avail, as a Koli (named Roza Maria Creado), resident of the village, died on December 1st. No further deaths occurred till December 11th."

In both the plan and the diagram the deaths are grouped into three groups, numbered 1, 2 and 3. No. 1 group is shown in red, No. 2 group in yellow and No. 3 group in green. The diagram shows the dates of the deaths and the number of deaths on each date, and also the period of the disinfecting and cleansing operations. The plan shows the location of every case of each group. An examination of the plan and the diagram throws some light on the way in which the disease spread.

"There is no doubt that the village of Worli was at the time of the outbreak of plague in a fit state to receive and propagate the germs of the disease on account of the drainage of generations having soaked into the ground on which the village stands, combined with the continual wastage of an ample water-supply.

"No. 1 case, as shown on the plan, died in house No. 6 on 1st December. There does not appear to be any connection between No. 1 case and the death in No. 2 group which occurred on the 11th December, but it is probable that No. 1 case in some way spread the infection to some one in group No. 3, who lived in his vicinity by some means other than personal. In glancing at No. 2 group, it will be seen in house No. 535 that two members of the group died and that two of group No. 3 were affected and died in the same house, which points to the strong probability of personal infection. In house No. 534, too, three deaths occurred of neighbours who lived in close proximity to three members of No. 2 group. In glancing further at the diagram it will be seen that in almost all the cases the disease forms itself into groups. But the chief characteristic of the disease, in this village was its virulence and the extraordinary short period in which it became epidemic. Usually several warnings take place, first sporadic imported cases exist perhaps for a month, then a few indigenous cases occur and there is a small outbreak, and then comes a lull in the disease, but in this instance it was not so. Group No. 1 was an indigenous case and the first in the village so far as is known. Group No. 2 consisted also of indigenous cases, and then group No. 3 commenced with three cases on December 18th, after which the whole village quickly became affected.

"As regards the disinfecting operations: on 20th of January a gang of 270 coolies were sent to the village; they disinfected all affected tenements; limewashed all houses, and stand-pipes with drainage to the foreshore substituted; the whole work being completed, as shown on plan No. 11*a*.* on the 29th of January. By this date, with the exception of 176 of the inhabitants, all had left the village. Many went to live in surrounding fishing villages only it is feared to infect them. Some 250 went by road to the Karli Caves at Lanowli, where several cases of a mild type took place after they had arrived and all recovered. Some 400 encamped near Worli village. Among these no fresh cases occurred after the ten days' incubation period, although these persons daily went to the village to get grain which was stored in the village granaries. During the epidemic 139 cases occurred in the village, nearly all of which proved fatal. On re-occupation of the village in March, no further indigenous cases occurred. It will be seen here that the course of the disease was most distinctly south to north. From enquiries made in the village, it has not been possible to ascertain that the advent of the disease was marked by any great mortality among rats, such as is almost invariably the case."

Sewree or Siwri.

*Case No. 5. Village of Sewree Koliwada (District No. X).*—Illustrated by plan and diagram on page 10 of Volume IV. The plan and diagram are prepared in the same manner as the plan and diagram for Worli.

"Sewree Koliwada is a village in the north-east of the island, containing a population of some 600 Kolis, inhabiting about 150 houses.

"The first case reported in the village occurred on the 12th of December, but it was not until January that the disease became epidemic. The disease here, as in Worli, was marked with great virulence: nearly every case being fatal.

"Disinfecting operations were carried on all through December and January in individual affected houses, but had little or no effect on the spread of the disease. On the 27th of January these operations were extended, and some 200 coolies were placed on the work; they disinfected and limewashed all and every house; rags and kutchra were burned; all roofs were opened for ventilation; and the place generally had a thorough cleansing. This work lasted five days, and the spread of the disease was checked. But at the back of the village there was in December and January a long and narrow pool of water. This pool was daily largely used by the male population of the village for ablutionary purposes in connection with defæcation. Professor Hankin in his researches at this village about the 24th January

* The plan on page 9 of Volume IV.

discovered the plague bacilli in large numbers in this water. Upon this being known, the pool was thoroughly disinfected with carbolic acid on or about the 27th January, and the whole field, which was littered with human excrement, was cleaned up. It is possible that in this incident lies the crux of the situation. Disinfecting operations apparently up to January 27th had very little effect on the spread of the disease, and it may be conjectured that its spread was fostered and maintained by the daily use of the water in the pool, especially when we know that most of those affected were males. The incident, however, is of interest, as from the 27th January little or no disease occurred in this village, which, although considerably reduced in numbers, was not altogether depopulated, there being never less than 350 people in the place." It will also be seen from the plan that the disease did not form itself into groups, as is usually the case, but was almost evenly distributed over the village, there being rarely more than one case in a house. This points to an unusual element in the spread of the disease, and this element General Gatacre believes to have been the use of the water of the polluted tank.

*Case No. 6. Village of Parel (No. X District).*—Illustrated by plan and diagram on page 11 of Volume IV. **Parel.**

The plan and diagram are constructed as before. There are 589 houses in the village, many of them well built and well ventilated, and many others overcrowded hovels of the most insanitary type, situated on sewage-sodden soil and abutting on narrow lanes; it was in houses of this latter description that the disease chiefly raged. The village had been drained, but no connections had been made between the sewers and the houses, and the sewage either flowed down on the surface of the narrow lanes or soaked into the soil. General Gatacre states that the village was in an almost hopelessly insanitary condition, and had been a hot bed of fever for many years.

"On the 6th of February a large gang of some 350 coolies were set to work to thoroughly disinfect and cleanse the village. The whole of the village was dealt with by the evening of the 11th, but, as will be seen from the diagram, this had little or no effect, the disease being marked with greater virulence after February 11th than before, and continuing more or less throughout March to be severe."

*Case No. 7. A fishing village in Mahim (No. X District).*—Illustrated by plan and diagram on page 12 of Volume IV. **A fishing village in Mahim.**

"In this village the advent of the disease was exceedingly sudden. Previous to the 20th of January only three cases are recorded, but on

the 20th, 21st and 23rd three further cases occurred, and then almost immediately the whole village became epidemic.

"Like all fishing villages, the houses here were of kutcha construction, with cadjan roofs brought down as low as possible to the verandahs, and so effectually stopping light and ventilation; there was likewise a total absence of drainage.

"On the 19th of February a gang of some 300 disinfecting coolies were sent to the village to supplement the disinfection of individual infected houses, which was already in progress. The coolies completed their work on the 26th February. The roofs were stripped from all the houses, and in many instances burnt, all the houses were disinfected and limewashed, and the disease was effectually stamped out."

**General lesson to be derived from the seven cases.**

The lesson to be derived from these seven cases is the same as the lesson pointed to by the facts narrated in previous chapters of this report, and by the facts that will be narrated in subsequent chapters. Filth, overcrowding, bad ventilation, and bad drainage are the fostering causes of plague. Where the conditions are not hopelessly insanitary, the vigorous prosecution of sanitary improvement combined with the segregation of the sick may check or stop the course of the disease. But in the worst class of cases nothing but the evacuation of the polluted locality and its destruction or a revolution in its sanitary conditions, will stay the epidemic.

**Disposal of the city refuse.**

A matter of general sanitary reform which had for a long time engaged the attention of the Municipality and which was also carefully considered by the Committee was the disposal of the general rubbish and refuse of the city. This rubbish had for a long time past been conveyed out of the city in carts and thrown on to a place called the flats, where the fresh deposit was daily covered by earth. The existence of this accumulation of refuse in the immediate vicinity of the city was held to be a danger to the health of the population at all times, and particularly so at a time of plague epidemic. Arrangements were made to remove the rubbish of the city to a more distant place.

**General improvement of the sanitary condition of Bombay.**

Finally, the Government of Bombay have under their consideration the general amelioration of the sanitary condition of the city, and its protection from fresh calamity by opening out the congested tracts, and by the substitution of reasonably well ventilated and sanitary buildings for the overcrowded, dark, and filthy tenements which are huddled together in the narrow lanes of Bombay.

# CHAPTER VIII.

## MEASURES IN THE BOMBAY PRESIDENCY AND SIND.

### Preliminary Remarks.

Division of the subject.

The first section of the present chapter contains an account of the general orders issued by the Government of Bombay, and discusses a few matters connected with those orders which require special notice.

In the succeeding sections the manner in which effect was given to the orders is illustrated by a description of the operations carried out in some important plague centres, notably Poona, the district of Kolaba, and the town of Cutch-Mandvi, in the Presidency proper; and Karachi, Hyderabad, Sukkur and Rohri in Sind.

The arrangement of subjects adopted in the last Chapter will, in so far as is possible, be again followed.

### General Measures.

Regulations under the Epidemic Diseases Act.

The first set of general regulations under the Epidemic Diseases Act was issued by the Government of Bombay on the 20th of February. A number of additions were made to the rules in the light of later experience, and the whole series was afterwards consolidated in a notification, dated the 29th of March. The consolidated rules are reprinted at length in Appendix IV. Their general purport is explained in the following paragraphs, which deal with the measures under their several heads.

#### OFFICERS.

Appointment of Plague Authorities.

The regulations in the first place empower District Magistrates to appoint special officers, either by name or by virtue of office, to be Plague Authorities for the purpose of devising and carrying out under his general directions all measures necessary to prevent the spread of the plague.

Duties of the District Magistrate and the police.

On District Magistrates the special duty is laid of doing their utmost, both personally and through others, to make it generally understood that the rules are absolutely necessary for the public

safety; they are also directed to see that no needless inconvenience is caused, that examinations are carried out with as much regard as possible to sex and to the customs of the country, and that everything is done to meet the wishes of the people so far as is compatible with the public safety. On the police the special duty is laid of assisting any duly appointed Plague Authority in the enforcement of the regulations.

## DETECTION OF CASES.

**Three main measures adopted.**

It has already been said that the prompt detection of plague cases is of the very first importance. The measures adopted in the Bombay Presidency and Sind to secure this end fall under three heads: (1) the compulsory report of cases and deaths, (2) house visitation, and (3) the examination of corpses.

**Compulsory report.**

In any locality to which the rule is applied by the District Magistrate the regulations require householders to give immediate information to the nearest Plague Authority of (*a*) any sickness due or likely to be due to plague, and (*b*) any death, whatever may be the cause of it. The Plague Authority (if he be not himself a medical officer) is required to give notice to the nearest duly qualified medical officer, and the medical officer is required to come to the place indicated.

**Grant of certificate of cause of death.**

On receipt of information of any death, the Plague Authority must register the death and give the informant a certificate. Until such a certificate has been received, the body may not be removed for the purpose of performing the last rites. If a body is removed in contravention to this order, the funeral procession may be stopped and interrogated, and some member of the party may be detained until all necessary information is given. Medical practitioners are also required to give notice of any plague cases or cases of fever with glandular swellings which come to their notice.

Every officer of the Government, however subordinate his position, is required to give notice at the nearest police station or Government office of every suspicious case of illness and every death likely to be due to plague which comes to his notice.

**Action to be taken on receipt of information.**

Immediately on receipt of information of a death or suspicious case of illness, the Plague Authority must visit the dwelling, and take all measures necessary to ascertain if it contains any plague case, suspected plague case, or infected person. Entry may, if necessary, be made by force, and any person found in the dwelling may be detained for examination. Details regarding the working of the visitation rule will be given in the second part of this Chapter. Plague Authorities are also empowered generally to have the cause

of death enquired into in all cases and, unless satisfied, to treat the case as a plague case.

Examination of corpses.

The examination of corpses with a view to discover plague cases is a matter that on more than one occasion engaged the attention of the Government of India. They feared that the general enforcement of this measure might prove peculiarly repugnant to the feelings of the native community. In the month of June, Surgeon-Major Reade (one of the officers with Chinese experience) paid a visit to Rajputana. He feared that plague might exist in Rajputana and recommended to the Administrative Medical Officer of the State that a system of corpse inspection of a thorough character should be instituted in the towns of Ajmere, Jaipur, and Udaipur. When this matter was brought to the notice of the Government of India they considered it necessary to inform the Agent to the Governor General in Rajputana that in their opinion this suggestion would be so strongly resented that the introduction of the measure would not be justifiable, except under circumstances of much greater danger than then existed. The Agent to the Governor General replied that the proposal had not been adopted on account of the discontent it would have caused.

Feelings of the people.

Rajputana.

Sind.

The examination of corpses in Sind came under special notice in connection with an order of the Commissioner to continue the process after the decline of the disease with a view to the immediate detection of any recrudescence. On enquiry it was ascertained from the Commissioner that the measure had been introduced with satisfactory results in the town of Shikarpur, and had then been generally adopted. The Commissioner, Mr. Wingate, made the following remarks on the subject :—

"When I sent Surgeon-Captain Milne to Shikarpur in March, there was every reason to apprehend that plague was about to break out there as it had broken out in neighbouring Sukkur. The result would have been disastrous, both because of the size of the town and because Shikarpuris have business relations everywhere, and the town was crammed with refugees from Karachi and Hyderabad. Deaths from imported plague were increasing. The death-rate from all causes was considerably in excess of the average. From the 19th March, of his own accord, Surgeon-Captain Milne examined every dead body himself. The first satisfactory result was that the examination proved that there was no plague in the town. This gave the town confidence. Next, any imported case was immediately discovered. Whether it was due to the examination of bodies or to the excellent arrangements for detaining new-comers under observation, or whether the protection of the town was due to other

means used or the immunity it enjoyed was independent of all means, I am unable to discriminate, but the fact is that the imported cases ceased. People with sick relatives did not attempt smuggled entry.

"I visited Shikarpur early in April and the examination of every dead body impressed me. I met the townspeople, and though I endeavoured to meet some of their wishes, not a word do I recollect being said about the examination of dead bodies. On the contrary, the people were free from further inquisition and the measure was, I think, liked. The measure was so effectual that it recommended itself and soon became general in most towns, and, so far I as know, without complaint. I have had numerous petitions relating to segregation, never one about examination of dead bodies."

Mr. Wingate subsequently ascertained that the examination would be repugnant to the feelings of the people as soon as the fear of plague was removed, and the measure was abandoned when the epidemic died out.

**Hardwar.** During the outbreak at Hardwar the examination of corpses was one of the measures which the Government of the North-Western Provinces and Oudh carried out with the concurrence of the inhabitants, but it must be remembered that the measure was adopted at a time of great local alarm.

**Bombay City.** In the month of August when the reported plague cases in the City of Bombay showed some tendency to increase, and a rapid rise of the total mortality of the city created a fear that the disease had again broken out and that cases were escaping detection, it was considered whether an examination of all dead bodies in the city should be enforced. The Government of Bombay decided against this course. In the first place there was a strong consensus of medical opinion that the inspection of corpses would not have any appreciable effect towards the more accurate registration of the cause of death, for the diseases to which the great majority of deaths were due were known to be devoid of bubonic symptoms. In the second place, the objections to corpse inspection in Bombay were so great that the Government hesitated to adopt it in the absence of certain and great advantage.

**Poona.** The following remarks in the late Mr. Rand's report on Poona are of interest:—

"In suburban and cantonment limits, where the death-rate never reached the height it did in the city, arrangements for the medical examination of corpses of persons who died in places other than hospital were made at an early stage of the operations. This had the effect of keeping down the number of houses which had to be disinfected and their inmates segregated, since when the

examination showed that death was not due to plague, disinfection and segregation were inapplicable.

"In the city, owing to the calls upon the time of the medical officers employed, a system of medical examination of corpses was not introduced till May 19th, when the work of the search parties stopped, and since that date it has been performed by Surgeon-Captain Beveridge, and has had the effect of saving the public from much inconvenience.

"By this system of inspection of dead bodies by a medical man combined with efficient death registration arrangements, it is improbable that any considerable number of deaths from plague can escape the notice of the authorities, and the enforcement of disinfection and segregation in all doubtful cases which it renders possible should go far to prevent a recrudescence of the epidemic."

**Officials stationed at burial and burning grounds.**

In Poona and at other places officials were posted at burial and burning grounds to record the burials and cremations. If the funeral party failed to produce a certificate of the cause of death, inquiry was made to ascertain where the death had occurred, and, if necessary, the precautionary measures were enforced.

**Periodical mortality statements.**

A useful measure enforced by the Government of Bombay was the submission of periodical mortality statements for all the principal places in the Presidency. A scrutiny of these statements showed whether there was an unusual mortality pointing to the existence of a hitherto undiscovered outbreak of plague.

## SEGREGATION OF THE SICK.

**General rule.**

The rule for the segregation of the sick empowers every medical officer who has been appointed a Plague Authority to examine all suspicious cases and all cases brought to his notice, and to detain and segregate persons suffering or suspected to be suffering from plague in any place appointed for the purpose. The District Magistrate or any officer appointed by him is empowered to take possession of any vacant ground or building for segregation shelter, compensation being afterwards paid.

The District Magistrate is also empowered to prohibit the removal of plague patients from houses or sheds, except in accordance with regulations framed by himself.

## SEGREGATION OF PERSONS LIKELY TO BE INFECTED.

**General rule.**

By an amendment of the original rules published on the 30th of August, Plague Authorities are empowered to detain, in an appointed place of observation, and for a period not exceeding ten days, any

person found within the limit of their jurisdiction whom they consider likely to be infected.

## DISPOSAL OF CORPSES.

**Funeral processions and burial and burning of corpses.**

The two following rules are prescribed to regulate the disposal of corpses:—

"The District Magistrate is empowered to make regulations, when he deems it necessary, for prescribing the route which shall be taken by a funeral procession from the place of death to the graveyard, burning ground or other place for final disposal of the corpse and the places (if any) at which such procession may halt, on its way, for funeral prayers, ceremonies or other purposes, for enforcing burial in certain places or at a certain depth and for requiring that quicklime be placed with the corpse; and may prohibit the burial or burning of corpses of persons reasonably supposed to have died of the plague in or upon ground other than that specially assigned by him for such purposes."

**Persons touching plague corpses.**

"When a person dies of the plague elsewhere than within the limits of a hospital, no one shall touch the corpse, except those who undertake the necessary duties of preparing it for the funeral. Such persons shall disinfect themselves according to the orders of the Plague Authority or person authorized by the Plague Authority."

## DISINFECTION OF CLOTHING, ETC.

**General rule.**

The Plague Authority may require people to adopt such measures as he thinks necessary for the disinfection of their persons, clothes, and other property. He may also in cases of necessity order any such property to be destroyed. The amendment of the 30th August specially empowers the Plague Authority to take measures for the disinfection of the clothing, etc., of persons likely to have been infected.

## DISINFECTION OF HOUSES AND GENERAL SANITARY PRECAUTIONS.

**Disuse of infected and insanitary houses.**

Any Plague Authority appointed for the purpose may prohibit until further orders the use as a dwelling house of any building which is or has been occupied by a sufferer from plague, or which is in his opinion in such an insanitary condition as to be unfit for human habitation. If necessary, the inmates may be forcibly removed from such a building.

**Abatement of overcrowding.**

The Plague Authority may also require the abatement of overcrowding in any dwelling so overcrowded as to endanger health, and

after the expiry of due notice may cause such number of the inmates as he thinks proper to be, if necessary, forcibly removed.

Cleansing and disinfection.

In the case of any dwelling treated under the above rules, or in the case of any dirty or insanitary building the Plague Authority may clean and disinfect the place, and may disinfect or destroy any clothing or other property found in it. Forcible entry is permitted if necessary. The operation may be performed in case of necessity immediately and without previous notice, or the Plague Authority may require the householder to carry out the necessary measures, intervening himself only if the householder fails to comply with the order. The Plague Authority is further empowered, with the consent of any First Class Magistrate having jurisdiction in the locality, to remove or burn any huts or erections in which a case of plague has occurred, or which are likely, from their insanitary surroundings or conditions, to give rise to or facilitate the spread of the disease.

Destruction of huts.

Ventilation.

District Magistrates or Plague Authorities are also empowered to break holes in the walls or roofs of houses, or to remove roofs altogether, for the purpose of admitting air and light.

## EVACUATION OF INFECTED LOCALITIES.

General rule.

"A District Magistrate is empowered to direct the evacuation of houses in the neighbourhood of an infected house, or of a block of houses, or a particular locality and to prohibit re-occupation of such houses or locality without permission. Notice for such period as the District Magistrate thinks suitable should be given, and temporary accommodation should be provided."

The subject of the evacuation of infected localities will be considered in some detail in the account of plague administration in Sind.

## PAYMENT OF COMPENSATION.

Principle enunciated by the Government of India.

In a Resolution of the 23rd March the Government of India laid down the principle which should govern the payment of compensation for property destroyed, in order to prevent the spread of plague, in the following terms:—

"The Government of India are of opinion that the principle upon which the payment of compensation should be regulated is that laid down in the Calcutta and Bombay Acts and followed in the plague regulations of the Governments of Bengal and Bombay. Persons should not be considered entitled to compensation because it becomes necessary to destroy property in their possession which is dangerous to the public health, and the prescribed authorities should always retain the

**Compensation not claimable of right but liberality to be shown to poor people.**

discretion to award or refuse compensation according to the circumstances of the case. At the same time, it is of importance that the disinclination of the poorer classes to disclose cases of plague should by all reasonable means be reduced, and the Government of India consider that, in the case of the destruction of bedding, clothing and similar articles, the authorities may be reasonably liberal in admitting payment of compensation, when the loss would fall upon people in very poor circumstances, to whom it would be a great hardship to bear it."

**General rules issued by the Government of Bombay.**

The following is the general rule issued by the Government of Bombay to regulate the payment of compensation :—

"Before the destruction of property of special value under Rule 12 or 13, the value of it shall be assessed by a Panch* of three persons, including the President, who shall be an officer appointed by the District Magistrate by name or by virtue of office and by general or special order. The President shall appoint the two other members. Subject to the sanction of the District Magistrate or of any officer specially empowered by him in this behalf, not being lower in grade than a First Class Magistrate, the award of the Panch shall be final and conclusive. A Plague Authority is empowered to decide whether an article which it is proposed to destroy is of sufficient value for a Panch to be called to assess its value. If he decides it is not of sufficient value, he may destroy it on the spot, and may in his discretion pay compensation to the owner: provided, however, that no person shall be entitled as of right to claim any compensation whatsoever. It is the desire of Government that Plague Authorities should show liberality and promptness in the exercise of their power to award compensation, and that, for example, a very poor man should be promptly compensated for the loss of clothes which, though of no special market value, may be of considerable value to him."

## APPOINTMENT OF PLAGUE COMMITTEES.

**Plague Committees for large towns.**

Whilst in most places the conduct of the operations was entrusted to the control of the District Magistrate—the executive head of the district administration—in some large towns which were the scene of severe outbreaks the example of the City of Bombay was followed in the appointment of Special Plague Committees to carry out, under the orders of the Government, measures to suppress the plague.

**Poona, Karachi, Hyderabad, and Sukkur and Rohri.**

Recourse was had to this procedure more frequently in Sind, where the disease had a tendency to locate itself mainly in large towns, than in the Presidency proper where the epidemic spread in a more general manner over the country. Poona was the only place

* Committee of Arbitration.

in the Presidency proper for which a Committee was appointed, whilst in Sind there were Committees for Karachi, Hyderabad, and Sukkur and Rohri.

No Plague Committees in districts.

The Government of Bombay considered the question of appointing Plague Committees for districts, but determined that it was best to leave the control of the operations in the hands of the ordinary District Executive Officers.

Constitution of Committees.

The Committees had to deal with both a civil and a military population, and the officers forming them were chosen from the Civil Executive Officers of the Government, and from Military, Medical, and Municipal Officers.

Rules.

Separate rules were published for each of the Committees; the rules were the same in every case, except that some minor additions were made to the Poona rules which were not reproduced in the Sind rules. The rules for Poona are given at length in Appendix IV.

General rules on certain subjects reproduced.

They reproduce the general regulations on the subject of the report of plague cases and the grant of death certificates; the cleansing and disinfection or destruction of infected and insanitary dwellings; and the payment of compensation. They also contain provision similar to that made in the general rules for the search of houses for plague cases and for the detention of persons found or suspected to be suffering from plague.

Special rules.

The remaining principal provisions are to the following effect:—

*General powers of the Committee.*—The Committee are empowered to exercise authority and control over the municipal and cantonment establishments, and may increase those establishments. They may suspend or temporarily rescind bye-laws and rules of the Municipality or Cantonment. They may incur expenditure out of local funds, and for this purpose they may control the general expenditure of the Municipality or Cantonment.

They may occupy any vacant ground or building for the purpose of military camps, segregation camps, hospitals, burial grounds, warehouses, or offices. They may temporarily impress carts and other vehicles and animals and labourers. The municipal and cantonment authorities and servants are bound to carry out any measures ordered by the Committee.

*Segregation of the inmates of infected buildings.*—If the Committee believe that a building is or has recently been occupied by a sufferer from plague, or that a death suspected to be plague has occurred in the building, they may cause the inmates to be segregated in an appointed place for a period not exceeding ten days, and may prohibit the use of the dwelling in the meanwhile.

*Disposal of corpses.*—The Committee are empowered to make regulations for enforcing burial in certain places or at a certain depth, and for requiring quicklime to be placed with the corpse.

## ARRANGEMENTS FOR THE RAINY SEASON.

**Difficulty of carrying out measures during the rains.**

The rainy season of 1897, which may be said roughly to have lasted from the middle of June until September, opposed the most serious obstacles to the prosecution of the operations. The difficulty of all out-door work is increased during the rains, but apart from this, the whole of the system of work is based on the segregation of sick and infected persons in specially provided shelter, whilst the large special staffs have often to be accommodated in temporary structures erected for the purpose.

**Provision of weather-proof shelter in the districts.**

It is not a difficult matter to provide temporary shelter for sick as well as for healthy persons, sufficient for their protection during the dry season, but only substantial structures serve as an adequate protection against the heavy rains of the monsoon months. To provide such structures on the scale on which fair weather shelter had been erected would have been an impossible task. Fortunately the early part of the rains was the period when the disease was at its lowest ebb, and the number of cases throughout the province was only about fifty to sixty a day. The extensive arrangement of the previous months were not therefore required. Nevertheless the difficulty, especially during the later, period of the rains, when the number of cases again began to increase, was severely felt. The Government of Bombay reported that it was not possible to carry out the full measures of segregation which were recognized to be desirable.

The existence of the difficulty was recognized before the advent of the rains, and such steps as were found possible were taken to meet it. On the 9th of April the Surgeon-General with the Government of Bombay reported that before the beginning of the rains alterations would be required in the site and construction of many of the temporary hospitals and segregation camps, which had been constructed on low-lying lands and of materials which were not weather-proof. The Government of Bombay directed the local administrative and executive officers to take up the matter without delay and, after consulting the medical and engineering officers, to submit detailed and practical schemes for sanction. The later records show that these orders were extensively carried out, but, as has been stated above, it was not possible to provide substantial structures containing the enormous accommodation which was supplied by the fair weather erections.

A similar difficulty arose with respect to the destruction of insanitary or infected huts. In the preceding chapter it has been noticed how the "U. H. H." scheme for the demolition of dwellings in the City of Bombay had to be deferred on the approach of the rains. Before the end of March the difficulty was recognised in the districts. On the 23rd of that month the Commissioner of the Northern Division reminded his officers that the rainy season was only three months distant and directed them to bear this matter in mind in ordering the destruction of huts. The Commissioner stated that the owner of the destroyed dwelling should be provided with a site and materials for the construction of a new abode, and that if destitute, he should also be given a little money. If it was found impossible to arrange for the erection of a new dwelling, the house was only to be unroofed and exposed to the air and light for a couple of months. These orders were communicated by the Government of Bombay to the Commissioner in Sind and to the Commissioners of the other two Divisions.

Suspension of the U. H. H. system in the City of Bombay.

Caution in destroying dwellings in the districts.

## INCIDENCE OF EXPENDITURE.

Two matters connected with the incidence of expenditure came under the special consideration of the Government of India, namely, the general allocation of expenditure between Local Funds and General Revenues, and the allocation of the expenditure in connection with the inspection of the railway traffic between Railway Administrations and the Government.

It is in accordance with the general financial system of the Indian Government that local expenditure on the preservation of the public health, such as expenditure on cleansing, disinfection, and similar matters, should be met by Local Funds, that is to say, by the revenues of local bodies, such as Municipal Corporations in towns, and District Boards in rural areas, within the scope of whose functions such matters ordinarily lie. In accordance with this principle the Government of Bombay issued the following two resolutions on the 18th of March:—

Allocation of expenditure between Local Funds and General Revenues.

"It is the intention of Government that expenditure should be borne as far as possible by Local and Municipal Boards. If any money is, however, required for urgent expenditure that cannot be provided speedily from Local or Municipal Funds, the Collector* may incur expenditure within the amounts mentioned by him, and Government will afterwards decide whether recovery shall be made from the Local Boards or Municipalities."

* The Collector of Belgaum, who asked that a sum of Rs. 2,000 might be placed at his disposal.

"Municipalities and Local Boards in areas already infected by the plague, or which are likely to be so infected, are requested to husband their resources and curtail their ordinary expenditure, in so far as this is possible, in order that they may be in a position to meet the emergent expenditure which the present crisis throws upon them."

**Temporary grants.**

When sufficient sums were not at once available from Local Revenues to meet the emergent expenditure, grants for the purpose were made from General Revenues, the question of the recovery of the amounts from Local Funds being deferred for future decision.

**Rules of the Government of Bombay.**

The general regulations of the Government of Bombay contain rules for the incidence of expenditure within and without municipal districts. In municipal districts expenditure is in the first instance, if no other funds have been made specially available for the purpose, to be defrayed out of Municipal Funds, but is recoverable from the owner or occupier of the building under the procedure laid down in the Municipal Act (Bombay Act VI of 1873). In rural areas outside municipal districts the rules provide that the whole or any part of the expenses of cleaning and disinfecting any building may be recovered from the owner or occupier under the procedure laid down in Bombay Act V of 1879 for the recovery of revenue. An appeal is permitted to the District Magistrate whose orders are final.

**Expenditure incurred by Plague Committees.**

The rules establishing Plague Committees in different towns direct that expenditure shall, in the first place, be met from Municipal and Cantonment Funds, but that the amount may be recovered from any private person who would be liable if the expenditure had been incurred under the ordinary law in force in the municipality or cantonment.

**Allocation of expenditure between the Government and Railway Administrations.**

The question of the allocation of expenditure between the Government and Railway Administrations was settled by a resolution issued by the Government of India, in the Public Works Department, on the 22nd of May. It was stated that any expenditure incurred by Railway Companies in providing sheds or other conveniences for plague patients and travellers suspected to be suffering from plague should be debited in the accounts of the Civil Department of the Government. Also that while the Government relied on railway companies for their cordial assistance, in so far as it could be given by their regular medical and other staff, they considered that the cost of additional staff should be met from Government revenues.

## AMOUNT OF EXPENDITURE.

**Expenditure in the Bombay Presidency in 1896-97.**

During the financial year 1896-97 the total direct expenditure on measures for the prevention and suppression of plague in the Bombay Presidency debited to Provincial Revenues was Rs. 1,13,899.

Estimate for 1897-98.

For the year 1897-98 sanction was given in a letter from the Government of India, in the Finance Department, to the Government of Bombay, dated the 28th of May, to expenditure being incurred on the suppression and prevention of plague up to a limit of five lakhs of rupees. This was the limit asked for by the Government of Bombay in a letter of the 6th May. That letter was based on an estimate of the probable expenditure during the first two months of the financial year (April and May). The estimate is interesting as affording an indication of the scale and nature of the charges. It was as follows :—

Estimate for April and May 1897.

| | Per month. Rs. |
|---|---|
| Poona District ... ... ... ... | 75,000 |
| Karachi ,, ... ... ... ... | 50,000 |
| Hyderabad (Sind) ... ... ... | 25,000 |
| Thana and Surat ... ... ... ... | 17,000 |
| Other districts ... ... ... ... | 10,000 |
| TOTAL ... | 1,77,000 |
| Disinfectants ... ... ... ... | 8,000 |
| Examination of passengers by rail and sea ... | 10,000 |
| Salaries of special officers ... ... ... | 18,000 |
| TOTAL ... | 36,000 |
| | Rs. |
| Total monthly expenditure Rs. 1,77,000 + 36,000 = 2,13,000 | |
| Rs. 2,13,000 × 2 = 4,26,000 | |
| *Add*—Non-recurring expenditure for disinfectants for Poona City and reserve .. ... | 74,000 |
| TOTAL ... | 5,00,000 |

A portion of the expenditure was to be recovered from Local Funds.

Revision of the estimate for 1897-98 with reference to the recrudescence of plague.

The recrudescence of plague made it necessary to incur expenditure largely in excess of the original estimate of five lakhs. On the 18th November 1897, the Government of Bombay reported that the direct plague expenditure actually charged to the Government in the financial year 1897-98 up to the 31st August amounted to Rs. 4,64,042. In addition advances aggregating Rs. 2,12,992 had been made, but not debited to the proper head pending the submission of detained bills, so that the total direct plague expenditure to be charged to the Government, in the first instance up to the 31st August, amounted to Rs. 6,77,034, and the total up to the middle of November was estimated to amount to about Rs. 8,50,000. The Government of Bombay estimated that the excess over five lakhs would be recovered from local bodies. To meet the additional expenditure the Government of Bombay asked that a further grant of five lakhs might be

placed at their disposal, making a total of ten lakhs for the year 1897-98. In a letter of the 29th December the Government of India sanctioned the incurring of expenditure up to a limit of ten lakhs during the financial year 1897-98. In the same letter the Government of India sanctioned an additional allotment of five lakhs of rupees for loans to local bodies under the Local Authorities (Emergency) Loans Act, XII of 1897. They stated that the loans should be made on the stipulation that the principal would be repaid during the five years from the 1st April 1900 to the 31st March 1905.

**Loans under the Local Authorities (Emergency) Loans Act.**

**Sums advanced by the Government of Bombay to Plague Committees and other authorities.**

The following is a statement based on the available information of the sums temporarily placed by the Government of Bombay at the disposal of Plague Committees and other authorities up to the 19th of July :—

| | | Rs. | |
|---|---|---|---|
| Up to May 10th, 1897 | ... | 1,30,000 | assigned for plague operations in Poona. |
| Up to May 11th | ... | 15,000 | placed at the disposal of the Collector of Thana. |
| April 29th ... | ... | 25,000 | placed at the disposal of the Commissioner in Sind. |
| April 6th ... | ... | 30,000 | placed at the disposal of the Karachi Plague Committee. |
| April 26th ... | ... | 70,000 | placed at the disposal of the Karachi Plague Committee. |
| April 26th ... | ... | 25,000 | placed at the disposal of the Hyderabad Plague Committee. |
| April 27th ... | ... | 15,000 | placed at the disposal of the Collector of Kolaba. |
| April 30th ... | ... | 5,000 | placed at the disposal of the Collector of Shikarpur. |
| May 20th ... | ... | 15,000 | advanced to the Sukkur Municipality. |
| June 14th ... | ... | 30,000 | placed at the disposal of the Karachi Plague Committee. |
| July 17th ... | ... | 30,000 | placed at the disposal of the Karachi Plague Committee. |
| July 19th ... | ... | 62,000 | placed at the disposal of the Poona Plague Committee. |
| July 19th ... | ... | 25,000 | placed at the disposal of the Collector of Kolaba. |
| TOTAL | ... | 4,77,000 | |

Loans under the Local Authorities (Emergency) Loans Act.

The following is a statement of the loans sanctioned by the Government of India under the Local Authorities (Emergency) Loans Act, 1897, for plague operations in municipalities :—

| Date of sanction. | Name of municipality. | Amount of loan. |
|---|---|---|
| | | Rs. |
| 21st May ... ... | Poona ... ... | 25,000 |
| 25th May ... ... | Bulsar ... ... | 5,000 |
| 31st May ... ... | Karachi ... ... | 1,00,000 |
| 17th June ... .. | Rander ... ... | 5,000 |
| 30th June ... ... | Sukkur ... ... | 1,00,000 |
| 2nd September ... ... | Sholapur ... ... | 5,000 |
| 26th October ... ... | Ahmednagar ... ... | 37,200 |
| 26th October ... ... | Thana ... ... | 10,000 |
| | TOTAL ... | 2,87,200 |

The loans all bear interest at the rate of 4 per cent.

On the 18th November the Government of Bombay had under consideration the grant of other loans bringing the total up to Rs. 4,72,200.

## Operations carried out at particular Plague Centres.

## Poona.

### PRELIMINARY REMARKS.

Report by the late Mr. Rand.

The following account of plague operations in Poona is mainly derived from the report prepared by the late Mr. W. C. Rand, who was Chairman of the Plague Committee. The report deals chiefly with the period from the outbreak up to the 20th May, by which time the severity of the disease had greatly abated. Mr. Rand's report first gives an outline of the measures adopted at the beginning of the outbreak and then details the operations carried out by the Committee. The same plan will be followed in this summary, and in the second part the subjects will, as far as possible, be dealt with under the headings used in the last and in the first portion of the present chapter.

Arrangement.

## MEASURES TAKEN BEFORE THE APPOINTMENT OF A COMMITTEE.

**First measures.** The first step taken for the protection of Poona from plague was the appointment of a medical man on September 30th, 1896, to watch passengers from Bombay at the Poona Railway Station. At the same time sheds were erected near the Sassoon Hospital for the reception of plague patients.

**Conservancy.** From October particular attention was paid to the conservancy of the city, and shortly before the end of January special regulations for the suppression of plague in Poona were sanctioned by the Commissioner of the Central Division under section 73 of Bombay Act VI of 1873. In the meanwhile an Assistant Health Officer had been appointed to plague duty.

**First measures taken by Mr. Rand.** At the beginning of February Surgeon-Captain Lloyd Jones was sent to Poona to assist and guide the Municipality in their efforts to put an end to the outbreak. On the 19th of the same month the late Mr. Rand took up the appointment of Assistant Collector of Poona for the charge of operations against plague. He began by instituting careful enquiries to ascertain the extent to which the disease had extended and formed the conclusion that the epidemic was far more widely spread than was shown by the municipal returns of plague attacks and deaths. He notified this fact to superior authority and then prepared a scheme for the suppression of the epidemic. In this task he was assisted by Surgeon-Captain Beveridge, an officer who had had experience of plague in Hong-kong, and who was appointed to be Mr. Rand's special assistant for plague purposes. It was decided, at the suggestion of Dr. Beveridge, to employ the agency of troops in carrying out the necessary measures, and at this juncture the Plague Committee was appointed.

**General Plague Hospital.** Prior to the appointment of the Plague Committee a General Plague Hospital had been erected to which the plague patients at the Sassoon Hospital had been removed. Considerable progress had been made in the construction of a general segregation camp, and sanction had been accorded to the construction of plague hospitals by the Hindu and Muhammadan communities. The Muhammadans had also been permitted to establish a segregation camp. Surgeon-Major J. B. Barry, who arrived at Poona for plague duty at the end of February, had been placed in charge of the general conservancy of the city, and was entrusted with the supervision of segregation camps and plague hospitals.

**Segregation camps.**

## GENERAL ORGANIZATION OF THE OPERATIONS OF THE COMMITTEE.

**Resolution nting the** The Committee was appointed by a resolution of the Government of Bombay of the 9th March, the terms of which have been explained

in the first portion of the chapter. The following officers formed the Committee:— Constitution.

Mr. Rand, Chairman.
Lieutenant-Colonel C. R. Philips.
Surgeon-Captain W. W. O. Beveridge.

The Committee was vested with authority over Poona City, Poona Suburban Municipal limits and Poona Cantonment. The area and population of each of these localities is given below:— Area under the control of the Committee.

| Name of district. | Area in square miles. | Population (census of 1901). |
|---|---|---|
| Poona City ... ... ... | 4·9 | 118,790 |
| Poona Suburban limits ... ... | 3·75 | 7,506 |
| Poona Cantonment ... ... ... | 4·25 | 35,094 |
| TOTAL | 12·9 | 161,390 |

The position of affairs at the time the Committee were appointed was one of great gravity and showed the urgent necessity for taking the strongest action. The measures so far adopted had been unavailing to stay the course of the epidemic and the city was in a condition of panic. A large proportion of the leading men of the place had fled and the attitude of the mass of the people was unfavourable and opposed to the adoption of the necessary precautions. An additional and very great difficulty was the want of labour to carry out the operations. "Many labourers were leaving the town and, owing to the panic that prevailed, those who remained could not be relied on to work regularly, especially if there was an element of danger in the work to be done." Position of affairs at the time of the appointment of the Committee. Unfavourable attitude of the people and want of labour.

To meet this emergency a carefully devised and systematic plan of operations was elaborated, and carried out with the assistance of volunteers from the British and native troops stationed at Poona and Kirkee. The city was divided into a number of districts to facilitate the systematic prosecution of the measures it was decided to enforce. These measures consisted mainly in the following precautions:— Division of the city, employment of troops, and principal measures.

(1) The removal of the sick to plague hospitals.
(2) The removal of persons who were apparently healthy, but had been exposed to plague infection, to segregation camps.
(3) The disinfection of houses and moveable property which had been exposed to infection.

Hospital and segregation camps. Military parties for search, disinfection, etc.

Five hospitals and four segregation camps were established for the prosecution of the first two objects, and military parties were constituted for the search for plague cases, the removal of the sick and the possibly infected, and the disinfection of houses. Municipal agency was employed collaterally with the military agency. A warehouse was opened at a central situation in the city for the storage of the contents of houses from which the occupants had been removed to hospital or to segregation camp. To minimise the chance of disturbance the streets were patrolled by native cavalry, and during a portion of the operations a picquet of native infantry was stationed at a central point. Picquets and patrols of cavalry and infantry were placed on some of the principal roads leading from the town to prevent the removal of plague-stricken persons by night.

Picquets and patrols.

## AID AFFORDED BY THE MILITARY.

Assistance of the military largely utilised.

In Poona the assistance of the military was utilised to a greater extent than in Bombay, and their conduct was subject to hostile attacks in some sections of the local vernacular press. The exact nature of the duties performed by the military will be explained in the detailed description of the operations, but it is necessary to make a few general remarks on their employment.

It will have been gathered from the description of the affairs in Poona at the time of the appointment of the Committee that the two main features of the situation that necessitated the employment of troops were the attitude of the populace and the difficulty in procuring labour.

Volunteers from the troops.

It was decided by the Government, after consultation with the military authorities, that volunteers for plague duty should be called for from among the troops, British and Native, stationed in Poona and Kirkee. The call was readily responded to, and it was found that many more volunteers than were likely to be required were willing to come forward. A plague duty camp was formed at Parvati, and 893 officers and men, British and Native, under the command of Major Paget, of the Durham Light Infantry, were placed on plague duty on the 12th March 1897. Of these 122 officers and men were posted as guards at the hospitals and segregation camps and the remainder went into the plague duty camp at Parvati.

Plague duty camp.

Total number of troops employed.

The greatest number of troops was employed from March 20th to May 5th when the total number on duty was 1,112. After May 5th, as the operations were contracted, the number of troops employed was gradually reduced till on June 1st it stood at 124. The troops were all kept in the camp at Parvati, except those who were stationed as guards at the hospitals and segregation camps and those who did

duty as workmen at the burial and burning grounds. The men in the plague duty camp were paraded daily before they left camp, and only those found to be in thoroughly good health were allowed by the Medical Officer to proceed. The health of the troops was excellent and not a single case of plague occurred amongst them.

Unfounded accusations made against the troops.

It has been stated above that accusations were made in the vernacular press and elsewhere against the conduct of the troops. These accusations went to the extent of specifically alleging that in some cases the modesty of native ladies had not been respected. The accusations were without foundation and were the fabrications of mischievous persons. The following are the words in which the late Mr. Rand described the conduct of the troops :—

Good conduct of the troops.

"The members of the Plague Committee concur with Major Paget in the high opinion he has expressed on the conduct of the troops, both Native and British. The discipline of the troops when at work in the city was excellent, and the utmost consideration was shown both by officers and men for the religious and social customs of the inhabitants. I may mention the reports on the conduct of the men who worked under them were called for from the officers commanding the various working parties, and that the reports received were without exception favourable as regards both British and Native troops.

"That the conduct of the men engaged on plague work was so good is doubtless chiefly due to the fact that they were under the immediate command of British officers who were responsible for the discipline and good conduct just as they would have been if they had been employed on military duty. In the case of search divisions the supervision was particularly close. It was one of the principles of the search that the parties of a division should be kept together as much as possible, and the officer commanding the division was therefore seldom far away from any of the parties under him. In the case of the fumigation and limewashing divisions, the supervision was not so close, as the exigencies of their work often compelled the parties of a division to work at a distance from each other."

## OPPOSITION ENCOUNTERED.

The populace excited to thwart the authorities.

The false accusations made against the troops who were employed on plague duty in Poona were part and parcel of the attempt that was made to thwart the action of the authorities in enforcing the measures necessary to combat the epidemic. In the City of Bombay, once the people were convinced of the necessity of the operations and the consideration with which they were being carried out, the opposition vanished. But this was not the case in Poona, where disloyal

persons endeavoured to work on the feelings of the people which were naturally excited by the operations, carefully and considerately though they were carried out, by the invention of malicious tales of oppression and violation of religious and social custom. "A section of the Brahman community," the late Mr. Rand stated, "including some of the most influential men of the city, were disinclined to support any measures that emanated from an official source, and were more likely than not to work against any operations that might be set on foot by the Government to deal with the emergency." The justice of this remark was fully exemplified. Malicious rumours were set afloat and disloyal and inflammatory articles appeared in the local vernacular press. The excitement thus fomented, culminated in the dual murder of Mr. Rand and Lieutenant Ayerst just at the time that the former of these officers had succeeded in subduing the epidemic.

Malicious rumours set afoot.

Murder of Mr. Rand and Lieutenant Ayerst.

The murder took place on the night of the 22nd June whilst Mr. Rand and Lieutenant Ayerst were driving away from an entertainment given at Government House, Poona, in celebration of the Jubilee of the Queen-Empress. The assassins at first escaped, but strong suspicion existed from the first that the murders were directly due to the fact that Mr. Rand was in charge of the plague operations.

Arrest of a person on suspicion.

Prosecution for sedition and conviction of the owner of the *Kesari* newspaper.

A person has been arrested on suspicion of having committed the murder and at the present time a judicial enquiry is in progress. A newspaper which rendered itself particularly notorious by reason of the inflammatory nature of the articles which it published was the *Kesari*, owned and managed by a leading Brahmin of Poona, named Bal Gangadhar Tilak. This person was arrested and tried before the High Court of Bombay on a charge of sedition under section 124 of the Indian Penal Code. He was found guilty and sentenced to eighteen months' rigorous imprisonment.

## DETECTION OF PLAGUE CASES.

Search parties.

Division of the city.

Six searching divisions.

As in Bombay, search parties formed the main agency for the detection of cases of plague. The work of the parties lasted from the 15th March to the 19th May. For the purpose of the searches and other plague operations the city was divided into five sections numbered I to V, and each section was subdivided into six divisions distinguished by the letters A to F. Whilst the operations were in full force there were six searching divisions also distinguished by the letters A to F. One of the five sections into which the city was divided was searched daily, the local area marked by a particular letter being searched by the division distinguished by the same letter. The divisions thus worked on familiar ground. At first the search of

a division occupied about four and-a-half hours, but later when the number of cases were fewer and the men better acquainted with the duty, the work proceeded more rapidly. One search was made each day excepting Sundays. In order that plague patients might not be removed before the arrival of the troops, no intimation as to what area would be searched was given to the public. The streets in which the search took place were patrolled by cavalry.

Method of search.

Each search division comprised ten parties, which at first consisted of three British soldiers, and afterwards of two British and one native soldier. "It was thought necessary that the burden of the search should be borne by British soldiers, as they were the most disciplined and trustworthy agency that could be obtained." Each search division was under the charge of a commissioned officer. Three commissioned medical officers were employed with the search divisions, each officer taking charge of two divisions. The search parties were accompanied by ladies who searched the rooms occupied by females who were of the class that do not appear in public. The ladies were, with the exception of three Mission ladies who volunteered for the work, paid employés of the Committee. As in the case of Bombay, an endeavour was made to conciliate the people, and at the same time to ensure the search being carried out with as little possible interference with their feelings and customs, by appointing native gentlemen of influence to accompany the search parties. It is stated in the late Mr. Rand's report that the functions of the native gentlemen were to explain to the public the objects of the search, to act as interpreters between the soldiers and the public, and to point out to the soldiers the portions of houses which custom forbade them to enter. The assistance of native gentlemen was not given so freely in Poona as in Bombay. About twenty volunteers attended every day, two or three of whom accompanied each search division. The late Mr. Rand mentioned ten gentlemen as having rendered useful service, of whom seven were retired native officers. He specially mentioned Professor S. Moulvi, of the Deccan College.

Search parties accompanied by ladies.

Help given by native gentlemen.

The late Mr. Rand has recorded the following remarks about the difficulties in the way of the search operations :—

Difficulties in the way of the search.

"The main difficulty apart from the question of agency in the way of the organisation of a house-to-house inspection lay in the religious and social customs of the Hindus and Muhammadans, who between them make up nearly the whole of the population of the City of Poona. The religious customs of the Hindus forbade people of other races to enter their god-rooms and cook-rooms. The females of the better class of Muhammadan families were all purdah* women. Among all classes

* That is, do not appear in public.

of the population, except perhaps the very lowest, there existed an aversion to the invasion of their privacy which is unknown in Western Europe. Again, a systematic search of houses by military agency was a novelty in Poona, and was on that account likely to be regarded with distrust and alarm."

**Attitude of the people except the Brahmins on the whole friendly.**

Notwithstanding this "the attitude of the inhabitants of the city towards the search parties was, on the whole, friendly, though people who had sick in their houses usually tried to conceal them. The Brahmin community was the only one whose behaviour towards the troops employed was generally unfriendly. In the Brahmin quarters the troops met with a good deal of obstruction, which, however, always stopped short of forcible resistance."

**Results.**

From March 13th to May 19th, 218,214 houses were searched, and 338 plague cases and 64 corpses were found. The houses in the city were searched on an average eleven times each. The sufferers from the plague were removed to hospital, and arrangements were made for the prompt disposal of the corpses. "The full value of the work done by the search parties," Mr. Rand stated, "cannot be gauged by the number of cases they discovered. The institution of the search by the military had the effect of causing the public to give information to the municipal authorities of a large proportion of the cases that occurred, and in many instances even to take patients to hospital without official pressure having been exercised."

**Search by municipal officers.**

The municipal plague operations throughout the city were under the charge of Surgeon-Captain Lloyd Jones. For the particular purpose of detecting plague cases the city was divided between three Assistant Health Officers, to each of whom a particular locality was assigned. The municipal and military agency worked side by side in the work of detecting cases: 608 cases of plague were removed to hospital by the municipal agency.

**Improvement of death registration.**

In addition to the scheme of search parties the Committee paid careful attention to an improved system of death registration as a means of obtaining early information of plague cases.

"From the time the military operations commenced, registration clerks were kept on duty from 6 A.M. to 10 P.M. daily within city, suburban and cantonment limits to register deaths of which information was given under rule 17 and to grant certificates of registry. At the same time Mukadams* were posted at the principal burning and burial grounds with orders to collect death registry certificates from funeral parties, and to hand over a member of the funeral party to the police if no certificate was forthcoming. Instructions were given to all policemen on duty to examine the certificates of all funeral

**Officers posted at burning and burial grounds.**

* Subordinate officials.

parties which passed them and to detain a member of the party when no certificate was forthcoming, in order that inquiries might be made as to where the death had taken place. The arrangements made were duly notified to the public. The startling decrease which took place in the mortality of Poona City during the month of April led the Committee to entertain a doubt whether deaths were not escaping registration. Accordingly, with a view of increasing the efficiency of the death registration arrangements, a British officer was placed in charge of them from April 26th. The actual work of death registration was entrusted to native officers, and the Mukadams stationed at the burial and burning grounds were replaced by men from the native infantry. Sowars were told off to inspect daily the smaller burial-grounds where it was not worth while maintaining permanent posts."

## TREATMENT OF THE SICK IN HOSPITAL.

The following is a list of the five hospitals at which plague patients were treated :— **Five plague hospitals.**

| Name of Hospital. | Date of first admission. |
|---|---|
| Sassoon General Hospital ... ... | 8th October 1896. |
| General Plague Hospital ... ... | 5th February 1897. |
| Muhammadan Plague Hospital ... | 8th March 1897. |
| Hindu „ „ ... | 15th March 1897. |
| Parsi „ „ ... | 13th May 1897. |

The first two were under official management and the remainder were privately managed, subject to the supervision of the Plague Committee.

*Sassoon General Hospital.*—This is the General Hospital for the whole of Poona and is under the charge of the Civil Surgeon. It was at first the only hospital to which plague cases were sent. **Sassoon General Hospital.**

The ordinary accommodation was found insufficient and extra temporary accommodation was provided in the compound and on railway land in its neighbourhood. When the Sangam General Plague Hospital was established (February 5th), all the patients then at the Sassoon Hospital were removed to it. For a short time afterwards Sassoon Hospital was used for suspected cases, but these also were finally sent to the Sangam Hospital : 204 plague cases were treated in the hospital, of which 117 terminated fatally.

*General Plague Hospital.*—This, the principal plague hospital, was situated near the Sangam and was built at the joint cost of the city and suburban municipalities and of the cantonment. Surgeon-Major Barry supervised the hospital. Dr. Darabshett was the Medical **General Plague Hospital.**

Officer in charge and Miss McIntosh superintended the nursing arrangements. The hospital was a very large one, and with its burial-grounds occupied at one time over fifteen acres of ground. In May rain-proof accommodation for the wet season was provided for 75 patients.

Private Muhammadan Hospital.

*Muhammadan Plague Hospital.*—This hospital was erected by the Muhammadans of Poona, the funds for its construction and maintenance being raised by voluntary subscription. It was assisted by a grant from the Plague Committee. Surgeon-Captain Beveridge was in supervisional charge and the management was in the hands of a committee, the leading spirit of which was Mr. Jaffer Jussuff, "the well-known Commission Agent." The late Mr. Rand stated that the success of the hospital was mainly due to this gentleman; no native gentleman in Poona "rendered services of equal value to Government and the public generally during the plague epidemic."

Construction and accommodation.

The hospital was constructed of temporary huts divided into two compartments intended to hold one patient each. When the hospital reached its greatest dimensions there was room for fifty patients, and this accommodation was not quite sufficient during the height of the epidemic, and during a short period some cases had to be sent to the General Hospital.

Management.

The committee of management admitted all Muhammadans to the hospital free of charge and provided them with free board and lodging. Plague patients were permitted to have one relative with them, but there was no regular nursing. The hospital was under the executive charge of a native practitioner and a pensioned Hospital Assistant. The native practitioner took charge of the treatment and used native remedies only. The patients preferred this. The Hospital Assistant was responsible for the sanitary condition of the hospital. The hos-

Number of cases.

pital returns show 309 cases treated, of which 179 died. In the case of 48 of the patients returned as cured it is considered doubtful whether they were really suffering from plague.

Value.

"In the points of cleanliness and smartness," the late Mr. Rand remarked, "the Muhammadan Hospital has compared unfavourably both with the General Plague Hospital and the Hindu Hospital" "It has however," he continued, "been of immense value owing to the confidence it has enjoyed with practically the whole of the Muhammadan community. The majority of the patients admitted belonged to the poorer classes of Muhammadans. No one would have been surprised if this class of people had obstinately opposed the removal of their sick to hospital. So far, however, was this from being the case that a large proportion of the patients were brought in by their relations of their own accord."

*Hindu Plague Hospital.*—This hospital was erected by voluntary contributions. It consisted of temporary huts divided into compartments, each intended for one patient. It was managed by a committee of Brahmins subject to the control of the Plague Committee, and was open to all Hindus, except those of low caste. Persons admitted were usually required to pay an entrance fee of Rs. 10 and Re. 1 a day maintenance charges. Patients might be attended by one relative who lived on the premises. Out of 157 patients admitted, 98 were Brahmins. Surgeon-Major Barry was in supervisional charge and Mr. V. V. Bhagwat, the visiting Medical Officer, supervised the treatment of patients. The chief part of the medical work was, however, done by the medical students who resided on the spot and took the place of hospital assistants. "The sheds provided for the patients were comfortable, and the hospital and its surroundings were for the most part kept in a good sanitary condition. That the hospital was appreciated by a considerable section of the Hindu population appears from the numbers that attended it. Surgeon-Major Barry's report of the management of the hospital is, however, generally unfavourable. The proportion of deaths to recoveries among true plague cases was higher, not only than at the Sassoon and General Plague Hospitals, but also than at the Muhammadan Hospital, where treatment on European methods was not in vogue." Hindu private hospital.

*Parsi Plague Hospital.*—This hospital was erected by the Parsi community at their own expense. It was a substantial structure, roofed with corrugated iron and thatched, and containing six commodious and well-ventilated wards. The wards were well equipped in every respect and complete arrangements were made for treatment and nursing. The late Mr. Rand described the hospital as a model one, and stated that it reflected the highest credit on the Parsi community. Only one patient was admitted up to the 20th May. Parsi private hospital.

## REMOVAL OF THE HEALTHY INMATES OF INFECTED HOUSES.

The systematic segregation of all the healthy inmates of houses in which cases of plague occurred was the feature of the operations in Poona which differed most from the arrangements in the City of Bombay. Systematic segregation of inmates of infected houses.

A system was elaborated under which (*a*) all the inmates of infected houses were discovered and removed, and (*b*) they were detained in segregation in large and carefully organised segregation camps.

The following account of the arrangements for removing the persons to be segregated is given in the late Mr. Rand's report :— Arrangements for removal of persons to be segregated.

"The work of removing to the segregation camps the apparently healthy inmates of infected houses was performed by Native Infantry

under the command of a British officer. A segregation party was present daily in the section of the city where the search divisions were working. A more laborious part of the duty of the segregators, however, was the segregation of the inmates of houses where plague cases had occurred which had come to light otherwise than through the agency of the search parties or where deaths had taken place which had not been certified by a commissioned medical officer to be due to some cause other than plague. The segregation officer, Lieutenant Owen Lewis, of the 14th Bombay Infantry, was furnished daily with a list of such houses.

"At the commencement of the operations segregation ceased to be carried out in the morning at the time when the search was going on in the city. It was found, however, that to avoid segregation, the inmates of infected houses commonly absented themselves from home during the ordinary working hours. It was therefore found necessary in the later stage of the operations to vary the hours of work for the segregators from day to day. The work of the segregation officer was by no means easy, and it was often a matter of much practical difficulty to determine who should and who should not be segregated. Mistakes were made at times, but I am satisfied that segregation was on the whole conducted with discretion and tact."

## SEGREGATION CAMPS.

**Objects of segregation.**

It is stated in the late Mr. Rand's report that "the object of segregating the apparently healthy inmates of plague-infected buildings was two-fold. First and principally to prevent those of them in whom plague was in a state of incubation from developing the disease in private houses and becoming fresh plague centres; secondly, to insure the non-occupation of plague-infected buildings till the buildings had been thoroughly disinfected. Ten days was fixed as the maximum period of detention, as that was believed to be the longest term for which the malady commonly remained in a state of incubation in a human being."

**The four segregation camps.**

There were four segregation camps, namely,—

| | | |
|---|---|---|
| The General | Segregation | Camp. |
| The Muhammadan | " | " |
| The Cantonment | " | " |
| The Parsi | " | " |

**General Segregation Camp.**

"The construction of the general segregation camp was commenced by the Municipality on the 1st of February. Under the administration of the Plague Committee its size was increased until it contained

122 rooms. The camp consisted of substantial thatched huts with mud floors. At the commencement the blocks were constructed to contain four rooms. Later on, blocks were built of two rooms only, the object of the change being to diminish both the loss that would be caused in the event of fire in any block, and the house space to be disinfected in the event of the occurrence of a case of plague. The size of the majority of the rooms was 12 feet by 10 feet. Fifteen cook-rooms of corrugated iron were provided for the use of the inhabitants of the camp. There were twenty latrines, twelve for men and eight for women. An abundant water-supply was obtained from a well furnished with a pump and cistern. Bathing and washing arrangements were made. The camp was lighted by standard lamps which stood in rows between the lines of huts."

Management.

The camp "was in charge of Surgeon-Captain Beveridge who visited it and inspected all the inmates daily, besides closely supervising the sanitary arrangements. His principal subordinates were the superintendent, the native officer in command of the infantry guard and the hospital assistant. Besides a native infantry guard, a sufficient staff of clerks, water-carriers, cooks, bhangis, sweepers, lamp-lighters and coolies was maintained."

Food supply.

"Though the rules contemplated the grant of allowances for rations to members of the labouring classes only, as a general rule, it was found to be a matter of much practical difficulty to determine who should, and who should not, receive them, and in practice they were allowed to nearly all the inmates of the camp. There were three Banias' shops within the encampment, which was visited daily by milk and vegetable-sellers. Some members of the Hindu community with the permission of the Plague Committee opened an eating house in the encampment where such persons as desired it could obtain food ready cooked on payment."

Muhammadan segregation camp.

"The Muhammadan segregation camp was built and equipped at the expense of the Muhammadan community, and was under the same management as the Muhammadan Plague Hospital, from which it was only a short distance away. It consisted of rows of chappar* huts, which could comfortably accommodate 100 persons. Sufficient latrines and cook-rooms were provided. The camp was under the supervision first of Surgeon-Captain Beveridge and then of Surgeon-Lieutenant Kiddle."

Cantonment segregation camp.

"The cantonment segregation camp consisted of three rows of 80-lb. tents, eight tents in each row, and could comfortably accommodate from 100 to 200 persons. Behind these were situated bath-rooms, store-houses, etc., built of corrugated iron. Latrines of corrugated iron were also provided. As at the other camps, the native infantry guard

*Thatched.

was accommodated in tents. Water was brought to within 200 yards of the camp by means of pipes and was conveyed into the camp by bhistis.* The supply was of a sound, potable character and was ample in quantity. All the inmates of the camp were supplied with rations. On arrival in camp each person had a good bath, and was provided with fresh clothes and bedding. All clothes and similar articles brought to the camp were thoroughly disinfected by dipping for 30 minutes in carbolic solution or corrosive sublimate solution, and placed in the sun to dry for five or six hours. The inmates of the camp were regularly inspected by the medical officer. New admissions were kept separate from the other inhabitants of the camp for the first three days of their detention. When a case of plague occurred, the tent which the patient had inhabited was struck and placed in the sun for three days. The ground was well soaked with carbolic solution and chloride of lime in solution was sprinkled about. The latrines were kept under close supervision and were attended to twice daily, the evacuations being disinfected before removal. Surgeon-Captain Thacker reports that the inmates of the camp declared themselves much pleased with the treatment they received and expresses an opinion that they improved in health and general appearance during their sojourn there. The camp was under the management of Surgeon-Captain Thacker and was well administered in every particular."

**Parsi segregation camp.**

"The Parsi segregation camp, which was situated alongside the camp last described, consisted of four large tents capable of accommodating from 40 to 50 people. It was provided with bath-rooms, a cook-house, a store-house and latrines. All were thoroughly suitable for their respective purposes. The camp was under the same management as the Parsi Plague Hospital, which was situated on the opposite side of the road and was under the supervision of Surgeon-Captain Thacker."

**Persons segregated and plague cases amongst them.**

The following statement shows the total number of inmates of the different camps and the number of cases of plague which occurred amongst them :—

| Name of camp. | Total number of inmates. | Number of plague cases. |
|---|---|---|
| Genera ... ... .. | †3,082 | 45 |
| Muhammadan ... .. | 659 | 6 |
| Cantonment ... .. | 302 | 2 |
| Parsi ... ... ... | 20 | *Nil* |
| TOTAL ... | 4,063 | 53 |

* Water-carriers.

† This does not include inmates discharged before the 13th March.

The percentage of plague cases amongst the inhabitants of the camps was thus only 1·3. Remembering that all the inmates had been subject to the immediate risk of infection, the smallness of this percentage shows the great direct saving of life which results from the removal of the persons endangered from their insanitary and infected surroundings. Small percentage of plague cases among the segregated.

## CLEANSING AND DISINFECTION OF INFECTED HOUSES.

This important portion of the work was performed by military parties and by the municipal authorities co-ordinately.

Under the military organization, there were two separate sets of operations, performed by the "fumigation parties" and the "lime-washing parties." The 'fumigation parties" would be more correctly described as "disinfecting parties." When the operations were at their height there were three disinfecting divisions, each consisting of a number of military parties. Disinfecting and limewashing parties.

"Before the operations of the military commenced, a list was prepared of all the houses in the city in which plague cases or deaths from any cause had occurred since March 1st and which had not already been disinfected. All houses on this list had to be dealt with by the fumigators, thereafter they were supplied daily with a list of houses from which fresh plague cases or deaths from any cause had been reported to the Municipal authorities. In addition to the houses entered in these lists all houses in which cases or plague corpses were found during the morning's search had to be disinfected. Preliminary arrangements.

"The preparation of correct lists of houses for fumigation was found to be a matter of considerable practical difficulty. Persons who reported deaths at the Municipal office constantly gave the address of the deceased incorrectly, thereby exposing an uninfected house to disinfection and its inmates to the inconveniences of segregation. To get over this difficulty, the Municipal Conservancy Inspectors were entrusted with the duty of verifying the addresses at which plague attacks and deaths had occurred. The work was indifferently performed by them and was accordingly made over to the assistant masters from the Poona High School, whose services were lent by the Director of Public Instruction. It was finally transferred to non-commissioned officers of the native infantry. List of houses to be disinfected.

"During the greater portion of the operations the fumigation divisions worked daily over the same local area as the search divisions. One or more fumigation parties accompanied each search division for the purpose of disinfecting any houses where cases might be found in the morning's search. The remaining parties of the fumigation divisions were employed on the disinfection of houses entered on the fumigation lists, and situated within the section of the city to be searched on the Method of procedure.

particular day. At the close of the operation, when the number of houses for disinfection was small, this arrangement was not strictly adhered to, and the fumigation parties were employed in whatever part of the city there was work for them to do."

Two alternative processes of disinfection were prescribed in the rules—(*a*) fumigation, and (*b*) flushing with a solution of corrosive sublimate. In practice the second process was found to be the best and was generally adopted. In all 1,918 houses were disinfected.

**Cleansing and limewashing parties.**

After the disinfection of the houses came the limewashing and cleansing operations and the destruction of rubbish. This work was performed by separate "limewashing parties." During the height of the epidemic there were three limewashing divisions, each consisting of thirteen parties.

**Method of procedure.**

"The limewashing divisions usually worked in the portion of the town in which the search and fumigation divisions had worked on the previous day. Officers commanding limewashing divisions were furnished daily with lists of houses for limewashing. All houses which had been disinfected, either by the military fumigation divisions or by the Municipal staff, were included in these lists. Houses, which though not infected were found to be in a filthy state, were also included.

"It was found at the beginning of the operations that rather too many articles were at times destroyed as rubbish. Orders were accordingly issued on March 26th to officers commanding limewashing divisions to visit, if possible, all houses to be limewashed [illegible] to decide what should be destroyed in each. Where a house [illegible] limewashed, any property of value which it contained was [illegible] handed over to the neighbours for safe custody. When this [illegible] not be arranged, which seldom happened, all valuables were [illegible] to the Plague Committee's warehouse, where they were kept till claimed by the owners."

From March 15th to May 19th, 3,068 houses were limewashed.

**Work done by the Municipality.**

Co-ordinately with the work of the military parties European inspectors were employed by the Municipality under Surgeon-Captain Lloyd Jones to superintend the disinfection of houses where cases of plague were discovered by the Municipal establishments, and the opening up of houses which were badly ventilated or lighted.

## PAYMENT OF COMPENSATION.

In a letter dated the 14th May, the late Mr. Rand gave the following description of the arrangements made for the destruction of property

and the payment of compensation. These arrangements were carefully designed to prevent poor people from suffering a loss which they could ill afford and the fear of which would have been an additional inducement to conceal cases of plague:—

Careful arrangements to prevent poor people from suffering loss.

"Search parties are forbidden by the orders of the Plague Committee to destroy any property except the mats or bedding of plague patients. The mats or bedding are in practice destroyed in the presence of the medical officer who accompanies the search division. The medical officers are supplied with cash advances for the purpose of enabling them to pay compensation on the spot for articles destroyed. Fumigation parties are forbidden to destroy any property whatever. Limewashing parties are instructed to burn all rubbish found in the houses which they limewash, but are forbidden to destroy property of any value to the inmates except under the orders of a medical officer. In order to guard against any undue destruction of property as rubbish, officers commanding limewashing divisions have been ordered to visit, as far as possible, all houses which are limewashed and decide what should be destroyed, and when property of any value to the owners is destroyed, to note the approximate cost of replacing what has been destroyed, in order that compensation may afterwards be paid. In practice nothing is destroyed except in the presence of a medical or military officer, and when property of any value is reported by an officer to have been destroyed, compensation is paid if the owner is a poor man.

* * * * * *

"The Committee have done their utmost to impress on everybody connected with the operations that property of any value to the owners is not to be destroyed unless a medical officer declares it to be necessary to do so, and they believe that except perhaps during the first few days of the operations, when the men did not perfectly understand what they had to do, very little of substantial market value except infected bedding has been burnt. They are of opinion, however, that a good many articles, such as apparently worn-out clothes, old rags, and pieces of sacking, which, though of little or no market value are of some use to the owners, are destroyed as rubbish without compensation being paid for them. The destruction of articles of this class, as well as the breaking up of certain floors, which is part of the process of disinfection practised at Poona is undoubtedly a hardship to the poorer classes in a year of high prices such as this, and the Committee therefore propose to pay at the close of the military operations a small fixed sum as compensation to householders of the labouring classes at whose houses articles have been burnt and who have not previously received compensation."

## GENERAL SANITARY PRECAUTIONS.

General improvement of sewage and conservancy arrangements.

The general charge of the conservancy of the city was entrusted to Surgeon-Major Barry on the 27th of February and remained with him throughout the operations.

The sewage and conservancy arrangements of the city were found to be very defective, and Dr. Barry immediately set about their improvement and reform. The first essential was to provide an efficient supervising establishment. Eighteen British privates with two non-commissioned officers were appointed conservancy inspectors. A respectable English-speaking native was attached to each of these as sub-inspector. During part of the time a British officer was detached for their supervision. A new health officer was appointed, and considerable additions were made to all branches of the subordinate conservancy establishment. Special attention was paid to the systematic flushing and disinfecting of privies and drains. The work of the conservancy labourers was carefully supervised and the regular removal of night-soil from privies was enforced. Open spaces and lanes as well as the main streets were systematically cleared of rubbish. Steps were taken by the issue of notices under the Municipal Act and otherwise to cause insanitary privies to be put in a sanitary condition. The city having been brought into a fair state of cleanliness, the special subordinate conservancy establishments were ordered to be discharged from May 16th. Twelve British non-commissioned officers and privates with their sub-inspectors were however retained. The late Mr. Rand was of opinion that the measures taken had the effect of materially improving the sanitary condition of Poona, and that there was little doubt that at the end of the main operations the city was cleaner than it had ever been within the memory of living man.*

Appointment of inspectors.

Work done.

## POONA CANTONMENT AND SUBURBAN MUNICIPALITY.

Arrangements in the cantonment and in suburban limits.

In the cantonment and the suburban municipality the work was carried out under the control of the Plague Committee and on the same lines as in the city. It is therefore not necessary to examine the details. In the cantonment the operations were under the direct administration of Colonel Newnham Smith, the Cantonment Magistrate, to whom the Committee delegated certain of their powers. Similarly, in the suburban municipality the Chairman of the Managing Committee took immediate charge of the operation under powers delegated to him by the Committee. Very few cases occurred within the suburban limits.

* Unfortunately even these thorough precautions did not save Poona from a second virulent outbreak of plague during the recrudescence.

## Kolaba District.

Report by Dr. Collins.

Surgeon-Captain Collins, who was deputed by the Bombay Plague Committee on the 10th of May to take charge of the operations in Kolaba district, has given a brief and interesting account, which is reproduced at length below, to serve as an instance of work in district towns and villages:—

Ceneral arrangements.

"With a view to coping with the epidemic plague hospitals were opened at Panwel, Mora, Uran, Karanja, Pen, Alibag, and Revdanda, and each placed in charge of a hospital assistant. The provisions of Act III of 1897 were put into force; plague authorities were appointed; arrangements were made for house-to-house inspection; segregation camps were established; and orders were issued to have the towns and villages disinfected and put into as sanitary a condition as possible. The Inspector-General of Police sanctioned the enlistment of 110 extra police for the district, and these were posted for duty to the different towns, with a view to establishing a thorough inspection of houses for information of fresh attacks. All infected houses were vacated on the occurrence of cases of plague; the houses were then disinfected, limewashed, and the tiles or thatches removed to allow of free entrance of air and sunshine; the streets and gutters were also flushed and sprinkled with carbolic powder. On the 3rd March Professor Haffkine, at the invitation of Mr. E. W. Carrol, went to Uran and inoculated 110 persons with his prophylactic serum; and again, on 13th March, he inoculated and re-inoculated in all 192 persons, including 34 Kolis, 73 Parsis and 5 Europeans."

Visit of Bombay Plague Committee.

"The Bombay Plague Committee visited the district at the end of April. They first came to Alibag, where they found that out of a population of 7,000 inhabitants, only some 400 had remained in the town, the remainder having fled panic-stricken into the surrounding villages; a few days later Revdanda, Theronda, and Choul were visited, also Panwel, Mora, Uran and Karanja. As the result of these visits it was decided that all the towns in the district should be thoroughly limewashed and disinfected on scientific principles with a view to putting them in a sound sanitary condition, and the following disinfecting staffs were despatched to the different places:— To Theronda and Revdanda, Inspector Brady and 100 coolies; to Alibag, Inspector Stazza and 150 coolies; to Karanja, Inspector De Sa and 50 coolies; to Uran, Inspector Jan Saheb and 25 coolies; and to Panwel, Inspector Jenner and 50 coolies. The whole of the operations were placed under the superintendence of Mr. T. G. B. Atkinson.* The disinfection was begun early in May, and completed

Limewashing and disinfection of all towns in the district.

* One of the Chief Inspectors of the Bombay Municipality, who had acquired great experience in disinfecting work.

in a satisfactory manner by the end of June. The benefits to the district of this thorough cleansing are incalculable. All the towns that were in a filthy condition have now been brought to a condition of average cleanliness.

Difficulties in dealing with the people.

"Throughout the epidemic the difficulties in the way of combating the evil, owing to the prejudices of the masses and the scarcity of labour, were enormous. Great trouble was experienced in getting people to disclose the occurrence of cases of plague, and then inducing them to remove the plague-stricken patients and their families to the hospitals and segregation camps. These difficulties were more especially experienced in dealing with the Brahmins, who all through gave us very little assistance in quelling the disease, though in almost every case patients who recovered in hospital expressed their regret that more of their fellow-sufferers did not avail themselves of the hospitals, and invariably spoke very highly of the manner in which they were treated.

Good effects of segregating healthy inmates of infected houses.

"As regards the segregation of the healthy from infected houses, I may mention one instance of its highly beneficial effect. On the 1st June a policeman was attacked with plague in the police lines at Alibag. He was removed to hospital and died three days after of a very virulent type of the disease. The room in which he was attacked was immediately disinfected with perchloride of mercury and the roof removed, while the whole of the inhabitants of the lines were promptly removed into a segregation camp, the result being that not a single case of plague occurred amongst the police at Alibag. All the rooms in the lines are covered with a common roof, and the partition walls between each quarter do not extend quite up to the roof, so that there is a free circulation of air between the individual rooms. There is not the least doubt that had the quarters not been immediately vacated, there would have been a general outbreak of plague all through the lines."

## Cutch-Mandvi.

### PRELIMINARY REMARKS.

Report by Dr. Wilkins.

In Chapter V it has been stated that the seaport town of Mandvi in the Native State of Cutch was the scene of one of the most virulent outbreaks of the epidemic. The following account of the measures taken for its suppression is mainly derived from the report by Surgeon-Lieutenant-Colonel J. S. Wilkins, the officer entrusted with the control of the operations. Unfortunately the existence of

the epidemic was not ascertained until it had reached a virulent stage. The local authorities appear to have reported the existence of plague on the 8th April, but it must have been in existence for some time before that date. The Political Agent, Major Hyde-Cates, having received information that the disease was more serious than had been reported, went to Mandvi on the 20th April with a view to organise preventive measures. By this time the reported death-rate was 70 to 80 a day, and the actual death-rate was probably considerably greater. Major Hyde-Cates was assisted in the first effort to organise effective operations by Dr. Lowson. The work was rendered in the highest degree difficult by the terror of the people, their dislike to the necessary measures, and the difficulty in procuring labour. The situation was said to be desperate and the people were panic-stricken and not attending on their sick. In this extremity help was asked for from Bombay and was afforded, on the direction of the Governor in Council, by General Gatacre's Committee. With the approval of His Highness the Rao of Cutch Surgeon-Lieutenant-Colonel Wilkins, who had been in charge of No. V District of the City of Bombay, left for Mandvi on the morning of the 27th April. He was accompanied by a native medical practitioner, four nurses, a hospital assistant, six sepoys and a non-commissioned native officer, three ambulances, and four native servants. Further relays of staff, medical and disinfecting, was sent from time to time as fast as they could be collected, with two experienced inspectors and a large staff of Bombay labourers for disinfecting work. Surgeon-Captain Mason followed on the 11th May.

Beginning of the epidemic.

Desperate situation.

Help sent from Bombay.

## DETECTION OF CASES.

As in other places, search parties and an improved system of death registration were the measures adopted to ensure the detection of cases and the removal of the sick to hospital.

"For the removal of the sick we formed search parties in the city, and we had very difficult work getting at these, as the people were very reluctant to have their sick taken away to the hospital, and every endeavour was made to evade the search parties. In our visitation to the houses many cases were found either dead or dying, and all feeling of humanity amongst the people seemed to be blunted, as on several occasions we unlocked doors closed from the outside and found cases left to die, chiefly women. This house-to-house visitation was instituted at once and is still going on, as the necessity for removing every infectious agent still remains, and the people are so apathetic or ignorant that they prefer the risk of infection in their own houses to the removal to the hospitals. The Plague Committee had sent three ambulance carriages with me, and

Search parties.

Difficulties in dealing with the people.

**Ambulances.** we had to obtain five others from Bombay to enable the sick to be removed in comfort. The country carts used with the ambulances were rather a rough method of transport, but, strange to say, some of the people preferred these bullock-carts to the ambulances."

**Death registration.** For the purpose of securing a more accurate death registration, reliable persons were posted at the various burial and burning grounds, and in especial at the city gates, to take the names and addresses of the deceased.

## TREATMENT OF THE SICK IN HOSPITAL.

**Five plague hospitals.** Five plague hospitals were established for the treatment of the sick. The following is a statement of these hospitals and the cases treated in each from the 24th April to the 21st June:—

| Name of Hospital. | Admitted. | Discharged. | Died. | Remaining. |
|---|---|---|---|---|
| Hindu ... ... ... ... | 937 | 239 | 646 | 52 |
| Hajira (Borah community) ... ... | 91 | 38 | 53 | 0 |
| General Muhammadan ... ... | 193 | 31 | 65 | 7 |
| Khatri ,, ... ... | 60 | 37 | 23 | 0 |
| Khojah ,, ... ... | 29 | 17 | 3 | 9 |
| TOTAL ... | 1,220 | 362 | 790 | 68 |

**Staff.** The following was the total medical and nursing staff:—

| | |
|---|---|
| Commissioned medical officers ... | Surgeon-Lieutenant-Colonel Wilkins.<br>Surgeon-Captain Mason. |
| Medical Practitioners ... ... | 2 |
| Lady Doctor ... ... ... | Mrs. Van Ingen. |
| Senior Nurse ... ... ... | Mrs. Remy. |
| Nurses ... ... ... | 15 |
| Hospital Assistants ... | 4 |
| Assistants ... ... ... | 3 |
| Students ... ... ... | 2 |

**Hindu Hospital.** *The Hindu Hospital* was a large masonry building, "very suitable for a hospital and capable of accommodating about 150 patients. The open verandah-like rooms were about 200 feet in length on two

sides of a square, the other sides being occupied by a cooking-room, orderlies' quarters, etc.; the middle was a quadrangle containing a well of water.

"The hospital was divided into two portions—one wing for females and the other for males; but as the patients flocked in and the female ward in particular got much overcrowded, I had three sheds built in the quadrangle. The two long pucca-built wards were then given over to the females—who held by far the greater number of sick—and one of the chappars or sheds given for the males with a small ward in the building (where about 30 cases could be accommodated). This relieved the tension in the wards, and we used the second shed as a convalescent ward for females and the third as a convalescent for males. Wards.

"A batch of coolies were always on the premises with plenty of lime ready, and the wards were kept as clean as possible, and the use of disinfectants was free. To allow of greater ventilation the tiles were removed here and there and roof ventilation was then obtained. Disinfection and ventilation.

"It is impossible to describe in words the hospital and its sights. The two long wards full of sick lying side by side in every stage of this dreadful disease; the nurses going about here and there in their merciful work; the ward orderlies and other attendants; outside the constant admission of patients in carts and ambulance carriages; and in one angle of the square the dead lying in numbers prior to removal to the burning ghât near. It was a mournful sight that met our eyes every morning and evening when we had to pass near the burning ghât and saw the numerous fires which told the heavy mortality. The whole of May and the first week of June, or for about five weeks, the admissions and deaths were heavy, and it was not till about the second week in June that anything like a sensible diminution in the admissions and deaths occurred. The discharged cured, also, were few till about the middle of May, and I am afraid many were sent out with their buboes not quite healed, so as to make room for others who had to be admitted. When it is considered that in this hospital alone 937 cases have been admitted up to the third week in June, it will be seen that the work was of no light character." General account of work in the hospital.

The hospital was in charge of Surgeon-Captain Mason, assisted by two medical practitioners and three hospital assistants. Four to eight nurses were attached to the hospital.

*The Hajira Hospital* for the Borah community was attached to their segregation camp in the suburb of Hajira. It consisted of a line of sheds. All requisites for the hospital were supplied by the community and, when possible, Dr. Wilkins detailed the lady Borah Hospital.

doctor (Mrs. Van Ingen), a nurse and an assistant to tend the sick.

Muhammadan Hospital.

*The Muhammadan Hospital* was originally a dispensary and was situated on the riverbank outside the city walls. It was capable of accommodating 30 to 40 sick persons. It was at first intended to provide (with enlargements) for the whole Muhammadan community, but the Khojas and Khatris insisted on a separate accommodation. The hospital was under the
ted by a native medical practitioner. Nursing assistance was *also* given.

Khatri Hospital.

*The Khatri Hospital* originally consisted of a badly made and managed hospital constructed of huts on the north of the city walls. After much persuasion and with the help of the headmen the people were persuaded to use a properly constructed hospital on a suitable site the patients did well. Medical and nursing assistance was given.

Khojah Hospital.

*The Khojah Hospital* at first consisted of sheds outside the city in which such medical and nursing help as could be afforded was supplied. Later, "owing to the kindness and humanity of Mr. Jairaj Pirbhoy, of Bombay," a staff of nurses and assistants were sent for the use of the community and the sick were then transferred to a building opposite the Muhammadan Hospital where they were properly looked after.

## EVACUATION OF INFECTED HOUSES AND QUARTERS.

Voluntary and compulsory evacuation.

A considerable portion of the city was evacuated by the inhabitants either voluntarily or, in the case of infected houses, compulsorily. The inhabitants of the evacuated houses were not however segregated, and Dr. Wilkins fears, no doubt with reason, that they spread the diseases outside the town. He states that were he required to take similar measures again, he would make different arrangements to induce the people to overcome their reluctance to segregation. His remarks on the subject are of great importance and are reproduced at length below:—

Failure to segregate the inmates of evacuated houses.

"On the breaking out of the plague at Mandvi, and when the disease was pronounced and fatal, a large proportion of the inhabitants, estimated at about 10,000 people, took refuge all around the town in the various gardens there are about, and also outside the villages within easy reach of the city. On our arrival here it was proposed to erect sheds about a mile to the west of the city in a convenient place, so that the inhabitants of the houses, where there were sick, could be kept under observation, and with this view a long row of comfortable sheds were erected, but the people refused to make use of them and preferred to live in the gardens.

Every endeavour short of actual force was employed, but failed, and it was concluded that it was better that they should be allowed to live in huts in these gardens, where they had at all events pure air and light, than that they should leave their houses and carry infection to other houses in the town. So a careful watch was placed on the villages and gardens, and the people of the villages warned not to enter Mandvi or allow Mandvi people to enter their villages. In most instances these warnings were not heeded, and cases of plague occurred in villages, whether prior to their cessation, when the inhabitants fled in all directions, or subsequent, it is difficult to determine, at all events, the attempt to segregate the inhabitants in these huts made for them failed. The reason given was that certain classes would not live near others. In case I were called on to take similar measures again, I think I should feel inclined to act differently—by calling the headman of each caste and getting him to select a spot for a camp which would answer the purpose and making him responsible for his caste people going there. There are a great number of gardens around the city of Mandvi and adjacent villages, and these afforded shelter to the refugees, who in most instances made themselves temporary booths and huts and lived in them with their families. A great many cases, I have no doubt, occurred amongst them, but I think it would have been better if they could have been persuaded to live in the segregation huts, where a better watch could have been kept on them and cases removed as they occurred.

Spread of plague into the interior.

Plan recommended by Dr. Wilkins.

"In the city itself all the gates but two were closed, and a watch kept on these by military sepoys from Bhuj, who were also posted around the city at one time. On any case being found, the residents of the house were sent out of the city and the house closed for lime-washing, and after cleansing thoroughly and removing tiles to some extent, the house was sealed, so that it could not be used again for some time. In this way a good deal of the city was evacuated."

Procedure at Bhuj on discovery of plague cases.

The Borah community were an exception to the general rule and, owing to the sense and foresight of their leaders, complete measures were taken at an early stage of the epidemic. The whole community removed from the city and was segregated in huts constructed for them in the suburb of Hajira. Nearly 400 men and 190 children belonging to this community were also inoculated with prophylactic serum. The hospital arrangements of the Borahs have already been described. The sensible measures adopted by the leaders of the community appear to have met with marked success; at any rate, the disease amongst them abated earlier than in the case of other sections of the population.

Good arrangements made by the Borah community.

## CLEANSING AND DISINFECTION OF INFECTED AND OTHER HOUSES.

**Large disinfecting staff from Bombay.**

Two hundred coolies under the charge of two capable European inspectors, and furnished with large quantities of lime and other materials, having arrived from Bombay, the arduous work of disinfecting and cleansing the filthy city commenced on the 21st of May. "The usual measures were taken, *viz.*, opening out the rooms as much as possible to light and air, and removal of part of the tiles, taking out all rubbish and clothes and burning them, the use liberally of disinfectants, and, finally, hot limewashing the whole premises."

The experienced Bombay inspectors and labourers proceeded rapidly with the work, and as the inhabitants took heart on seeing the plague decrease, the Bombay agency was gradually replaced by less expensive local labour. In addition to the regular disinfecting parties small gangs of labourers were placed at the city gates, so that when cases or dead bodies were removed through them, labourers were at once despatched to disinfect the house in which the sick person had resided. Finally, whole streets were operated on at a time, and the houses abandoned by their owners were opened and cleansed.

**Extensive cleansing and disinfecting operations.**

In this way the whole town was purified, and Dr. Wilkins states that he has no doubt that it was rendered cleaner than it had been for the past few centuries. Mr. Attes, the Bombay Disinfecting Inspector, gave the following account of the operation:—

**Description of the work.**

"3,338 houses were disinfected by me, containing 16,540 rooms. Tiles were taken off partially from the roofs of 2,540 houses to admit light and air; 8,843 coolies were employed on the above works from the 5th May to 21st June. I found it necessary to use about 12 oz. of carbolic acid to every cask of mixed lime, as the lime was more or less slaked. Care was taken to freely use this solution to the walls, more especially to the flooring until it fairly permeated it. In every instance the men were not allowed to enter the infected houses until some chloride of lime was used, and in some extreme cases where the smell of dead rats and cats was unbearable, I fumigated the rooms with about 2 lbs. of chloride of lime with 2 lbs. of disinfecting powder. This fumigation answered the purpose very satisfactorily, although expensive. In some extreme cases I used the pump and washed the walls and flooring with a solution of carbolic acid, and then limewashed the place with carbolic acid in lime. I found nearly 50 per cent. of the houses disinfected by me had dead cats and rats, and I believe if the disinfection had been started immediately the plague broke out (a month prior to our coming here), one-half of the mortality would not have taken place. The whole length and breadth of the town was fairly infected when we came."

### OTHER GENERAL SANITARY PRECAUTIONS.

Recommendations for much-needed sanitary improvement of Mandvi.

Dr. Wilkins did something towards the general sanitary improvement of the town by causing new privies to be constructed within and without the city, but he found the condition of affairs so bad that nothing but a set of radical alterations and reforms could place the city in a reasonably wholesome condition. In a letter to the Political Agent, dated the 24th May, he made a number of practical suggestions of great utility for the improvement of the city, and in his report these suggestions are set forth at greater length. The suggestions made by Dr. Wilkins have been placed before His Highness the Rao and arrangements have been made to destroy many insanitary houses with a view to give more air space in the city. The Government of India also informed the Government of Bombay with reference to Dr. Wilkins' suggestions that they trusted that the terrible experience of the epidemic had impressed on the local authorities the necessity for keeping the town in a more sanitary condition.

### CONCLUDING REMARKS.

Success of the operations in Mandvi.

The vigorous and ably conducted operations appear to have been eminently successful in combating the virulent epidemic which had taken hold of Mandvi, and the disease declined rapidly as soon as they had been brought into complete effect. Unfortunately the infection was spread from Mandvi to a number of villages in the interior where it still exists. This danger was realised from the outset, the Government of India expressed their anxiety on the subject to the Government of Bombay and asked what was being done to minimise the evil. In reply the Government of Bombay forwarded a letter from the Political Agent in which it was stated that the Mandvi staff was taking precautions in the villages in the neighbourhood of Mandvi to which the disease had extended; that Surgeon-Captain Ricketts, assisted by the State officers, was looking after the towns of Bhuj (the capital), Anjur and Mundra; and that the local officials were keeping a watch on the villages hitherto uninfected. Notwithstanding these precautions the disease spread widely in the interior, principally in villages situated in the sub-division surrounding the town of Mandvi.

Spread of plague and precautions taken in the interior.

## Sind.

### PRELIMINARY REMARKS.

General remarks and arrangement.

It is not necessary and it would be wearisome to detail under their different heads the operations carried out in Sind at the same length as the descriptions that have been given of the measures

adopted in various places in the Presidency proper. In the following account, which is mainly derived from the report by Mr. Wingate, Acting Commissioner in Sind, the history of the operations at Karachi and other principal plague centres will be given briefly and in chronological order. Particular notice will be taken of the special features of the work in Sind, the most important of which was the evacuation of infected localities, and the lodging of the inhabitants in health camps.

## KARACHI.

**Beginning of the epidemic.**

Plague was declared to be epidemic at Karachi on the 19th December, and the first case occurred shortly before that date. Early in October the Health Officer of the Municipality, Dr. Kaka, called attention to the necessity for special sanitary vigilance, and on the 16th December he informed the President of the Municipality that he had already experienced opposition, and that the residents of houses where cases had occurred flatly refused to permit disinfection of the rooms occupied by the sick. This opposition lasted for a long time and required most careful treatment. The recognised precautionary measures were introduced gradually and with great caution, and by this means it is said that the authorities were enabled to carry the people with them. But it was long before any systematic isolation or even treatment of the sick was introduced.

**Opposition of the people to the precautionary measures.**

**Limited segregation in hospital.**

On the 17th December a meeting was held where several of the headmen of the Hindu sects consulted with the Municipal authorities. On the 21st and the 23rd, the Municipality issued resolutions in which segregation in hospital was prescribed only when there was no suitable accommodation in the house of the sick person. In the meantime the cleansing and disinfection were being efficiently and energetically carried out by the municipal executive "as far as local conditions allowed." Suitable houses in the town had also been set apart as caste hospitals. In describing these arrangements, Surgeon-Captain Arnim, the Deputy Sanitary Commissioner, remarked that "there is a marked opposition among the Municipal Commissioners and the inhabitants of the town to the complete isolation which the removal of the sick to the Lyari isolation sheds would necessitate; indeed, there is reason to believe that, at present at least, the feeling among the townspeople would not admit of this segregation of all cases at the Lyari sheds." The position stood thus when the Commissioner in Sind arrived on the 3rd of January. He found that the municipal executive was displaying the greatest energy, and that the disinfection of houses with corrosive sublimate solution was being systematically prosecuted. But the caste hospitals were empty, and

**Cleansing and disinfecting.**

**Caste hospitals.**

every one recognised that the segregation of the sick could in the then existing state of popular feeling only be carried out by force.

Attitude of the people prevented compulsory segregation of the sick.

After carefully reviewing the position, the Commissioner came to the conclusion that compulsory segregation must not be enforced, and that means must be taken to allay alarm and conciliate the people. The Muhammadan communities formed the major portion of the population, and they declined even to set apart accommodation for the sick. It was determined to obtain the assistance of Muhammadan doctors, and a lady doctor and Muhammadan doctors were accordingly provided. At this time also the Municipality was divided into districts to each of which the Municipality appointed an inspector. Later on, the various districts were placed in charge of medical officers, members of the Indian Civil Service, and other gentlemen.

Spread of the disease.

From the beginning of January the disease increased rapidly and the question of the evacuation of the infected quarters, which was recommended by the Government of India on the advice of their Sanitary Commissioner, was then taken up with serious attention.

First attempt at evacuating infected quarters.

The name of Mr. Strachan, the Secretary and Engineer of the Municipality, is specially associated with the successful endeavours made to remove the inhabitants from the source of infection. He first caused an encampment of huts to be erected across the Lyari, but well away from the Muhammadan settlements. At the same time Mr. Tahilram, the President of the Municipality, and the Collector of Karachi, were persistent in their efforts to persuade the Nasarpuris, a sect of well-to-do Hindus, occupying good houses in the Old Town (the infected locality) to move into the camp.

Removal of the Nasarpuris to camp.

"For these people to live in mat huts," Mr. Wingate stated, "was a degradation from which they shrank. Eventually, they agreed to move, but only in their own conditions. These were wisely agreed to. To get the Old Town quarter completely evacuated and set an example that would silence prejudice were the objects in view. At this stage compulsion would have scattered the population like sheep, and distrust of the authorities would have been spread through the land."

The Nasarpuri camp.

When Mr. Wingate paid a visit on the 23rd January, he found that the health camp had just been occupied by 2,000 Nasarpuris. He states that the camp did Mr. Strachan very great credit. "It was well laid out, with water pipes and bathing platforms; in fact, the Municipality had spared no expense to make the camp attractive and convince the people that the desire was to save, not to kill. As an instance of the feeling at the time, a few days later a party would not enter ready-made huts, saying the huts might be poisoned, but they accepted new materials and made their own huts. It was not then known that plague affects the heart and the sudden deaths of

people, not apparently very severely ill, gave ignorant imagination its opportunity."

**Visit of Dr. Cleghorn.**

About this time Surgeon-Major-General Cleghorn visited Karachi and found the disease centred in the quarters, named Old Town, Machi Miani, Market and Bandar. These localities all lie in the main part of the town on the east of the Lyari River. He found nearly four hundred huts erected in the health camp and occupied by 2,500 to 3,000 Hindus. The huts were built separately and arranged along wide streets. All sanitary requirements were carefully attended to. The Muhammadans had also agreed to turn out of their houses, and huts were in course of construction for their occupation.

The inmates of the first camp were persuaded to migrate to them only on their own terms, and it was not at first possible to institute the careful medical supervision and precautionary measures which were afterwards adopted with such success in the health camps both of Karachi and of other plague centres.

**Extension of the evacuation system.**

The experiment of evacuation and residence in health camps having once been successfully started, it was soon extended, and as the disease spread to new quarters, the measure was found to be eminently successful in checking its virulence and its progress. In the end as many as forty-four camps were constructed. Of these, thirty-one were health camps,* nine were segregation camps for persons who had been exposed to infection, and four were observation camps. On the 11th of May the total population of the camps was 6,147 and on the 26th May it was 5,978. From the 8th March there were 242 seizures and 144 deaths in the different camps. Before the 7th March there were 56 deaths. A detailed statement of the health camps is given in Appendix VI.

**General remarks on the health camps.**

**Operations in progress at the end of January.**

This brief account of the health camps has anticipated the course of events. In the first week in February the epidemic reached its climax. At the end of January the operations in progress were briefly as follows :—

Cleansing and disinfecting streets and lanes.
Vigilant house-to-house inspection.
Supervision of burial and burning grounds.
Thorough disinfection of plague-infected houses.
Destruction of infected clothing.
Burning of infected huts.
Preparation of large health camps and persuasion of the inhabitants to move into them.
Ventilation of houses by making holes in the roof and walls.

* Nine of those were closed before the 11th May.

There was practically no segregation of the sick and no medical treatment. The disinfecting work had also fallen into arrears. **No segregation of the sick.**

To remedy this last important defect twenty subordinate revenue officers were brought into Karachi to supervise the work, and the infected portion of the town was portioned out between two members of the Indian Civil Service and a Police Inspector, each with a separate sanitary staff. Even with this organization it was found difficult to keep up with the work and the town was further sub-divided between a number of officers who volunteered for the work. Under the superintendence of these officers, the lost ground was soon regained. Every house was emptied as soon as it became infected, the sick person being left with one or two attendants and the rest of the occupants moving to camp. The house was then disinfected. "Soon the streets all over Karachi were almost impassable for heaps of burning rubbish and carts removing what would not burn, while the limewashing by owners or Municipal Agency became almost universal." By the 11th of February the arrear work in disinfecting houses had been overtaken and the operations had been carried in advance of the plague by the cleansing of localities (such as the Sadar Bazar) which had not yet been attacked. The systematic cleansing of houses in which cases had not occurred was then commenced. **Revision of disinfecting organisation and increase of staff.**

"With the increased mortality, it was feared there might be careless burying, and with increased stringency that bodies might be surreptitiously removed. From the beginning of January one or two police had been posted, but from the 3rd February the District Superintendent of Police was requested to take the burial and burning grounds under his personal supervision and thereafter the police returns became a very useful addition to the daily municipal record, allaying any suspicion lest deaths might be escaping record." **Supervision of burial and burning grounds.**

By the beginning of February the Trans-Lyari quarter, inhabited by a number of poor Muhammadan communities, had become infected. Work in the quarter was immediately taken up under the superintendence of an able Muhammadan Deputy Collector assisted by a selected subordinate Muhammadan officer and Muhammadan supervisors. **Trans-Lyari quarter.**

The beginning of February was also marked by the first efforts to bring medical aid to the sick and to segregate them. "The Assistant Collectors and other officers working in the town were becoming pretty well known, and it was hoped that access to the sick might now be obtained if a medical officer moved about in their company. In writing to Government . . . . it was stated that the compulsory removal of the sick would probably be the most effectual of all remedies, and was the one advocated by the Medical officers; but it **Successful attempts to segregate and treat the sick.**

was hopeless to work counter to the popular feeling and the Muhammadans were so far particularly obstinate." Surgeon-Lieutenants Niblock and Cornwall were deputed for the duty and reported themselves on the 12th of February. These two officers entered on their duties with zeal and devotion and quickly gained the confidence of the people. In a few days they "had won entrance everywhere" and convinced the poor that there was nothing to dread. With doctors in the city and at the railway stations plague patients began to be taken to the civil hospital. A plague hospital was therefore necessary and the Government High School was made available for ordinary patients, the civil hospital being reserved for plague cases. A fully equipped plague hospital with Dr. Niblock in charge was soon ready. A Charitable Relief Fund was started about this time and the money was used amongst other things for supplying necessaries and comforts for the hospital. Nurses were supplied by the Karachi Convent. "The Sisters occupied the upstairs or European wards of the hospital and lived there for several months, nursing the 60 to 100 sick below by day and by night, and entered on the dangerous duty with happy self-sacrifice. They were soon beloved. Later on they were joined by several nurses paid from the Charitable Fund and were assisted by the two Misses Carey of the Zenana Mission."

Officers appointed to look after the sick.

A plague hospital equipped.

Nurses.

General improvement.

By the middle of February the improvement in Karachi was perceptible. Disinfection of houses was up to date and general cleansing in full swing, and the unaffected quarters were being taken in hand in advance of the attack.

Kiamari and Manora.

In Kiamari and Manora to which the disease had spread, the operations were controlled by Major Morris of the Karachi Artillery Volunteers. He segregated every case with extreme care, but the disease did not cease at Kiamari till, later on, the old village of huts was burnt and the people disinfected and moved to a new site.

Special trains to camps.

Arrangements were made to run special trains to two suburban stations where the Collector of Karachi (Mr. Giles) and several European merchants had erected camps in which subordinate officials, office clerks, and labourers were safely housed out of reach of infection, and were able to come to work daily. "This was a very successful scheme, and a great boon to the mercantile firms who were being deserted by their establishments."

End of February measures completely carried out.

"By the end of February, the Collector reported that few cases now remained undiscovered, and hence the removal of the healthy was at once universally carried out. To this must be attributed the progress that was being made as shown in the decreasing mortality, and also to the sick being rapidly brought under medical treatment." In the Trans-Lyari quarter, where Sardar Muhammad Yakub Khan had

to contend with much fanaticism, isolation of the sick was only becoming possible, but by the middle of March segregation of infected families was the rule. Segregation camps were now being formed by Mr. Strachan in all directions. Early in March the new and unoccupied Lady Dufferin Hospital was utilized as a convalescent ward for the plague hospital.

Evacuation of the Trans-Lyari quarter.

"The 19th of March, the crowning day to the Sardar's work across the Lyari, saw the voluntary removal by the Muhammadan communities of all their sick, and 80 patients were during the day safely deposited in the isolation sheds, and all came under medical treatment. Mr. Giles, who has devoted himself to this quarter, was justly proud of the great achievement. Some 40 malcontent families withdrew to some distance, and from that date there was no reluctance but eagerness to isolate every case throughout the villages of the large Trans-Lyari tract."

Private hospitals.

"It should be mentioned that at this time the private hospitals were beginning to fill, and that Seth Vishindas, a wealthy and philanthropic citizen, quite fearless of plague, was constructing what developed into the best private hospital in Karachi, where he generously received Hindus and Muhammadans alike, having separate wards for each, and supplying medical and other attendance, food and medicine at his own expense. The removal of the sick difficulty, which had been such a mountain in the way of effective remedies, had thus quietly disappeared; and as the Collector remarks, a few days later the sick were being removed to hospital as a matter of course."

Rules under the Epidemic Diseases Act.

Special rules for Karachi under the Epidemic Diseases Act were issued on the 17th March. They will be found in Appendix IV. These rules and the general rules issued for the Bombay Presidency specifically empowered the adoption of the various measures which were being enforced, and their issue was not accompanied by any change in policy.

Appointment of a Plague Committee.

On the 20th March His Excellency Lord Sandhurst visited Karachi, and, after inspecting all that had been done, appointed a Plague Committee for the control of the operations, consisting of Brigadier-General T. A. Cooke, Commanding Sind District, as President, with the Collector, the Deputy Sanitary Commissioner, and Mr. Strachan as members. The Committee carried on the work on the lines already elaborated, but even so the "measure was like the relief of a beleaguered garrison." It had been necessary to send some of the officers who had studied the measures in Karachi to the up-country stations where plague had broken out, and more officers were urgently required. "The General immediately threw himself heart and soul into the work, brought to bear the whole

strength of the military, with unlimited officers and men and habits of rigid discipline, on the existing material, and soon had the population under thorough control." The first sittings of the Committee were attended by Surgeon-Major Reade, one of the doctors who had been through the Hong-kong plague.

Disinfection of clothing and bedding before removal to camp.

"He suggested the bathing and disinfecting sheds for arrivals at each camp, the disinfection of all bundles and baggage brought to the camp, and similar arrangements on leaving. These suggestions were most carefully elaborated by the Plague Committee. Disinfection of the person and personal clothing had previous to this been in the back ground, the getting of sick and healthy out of the infected houses and the disinfecting and cleaning of those houses absorbing all the time of the workers. Now immediate transference to hospital and camp was working smoothly, and it was possible to perfect that control of the camps to which Surgeon-General Cleghorn has invited attention. This thorough and painstaking disinfection of the clothing and bathing of the persons in tubs with a mixture of Jeye's fluid in the water soon extended up-country with marked effect."

Military search parties.

"On the 25th March, the first military search party went out. It was very carefully organised and admirably managed, the civil officers accompanied by medical men taking charge of each party. The General had carefully instructed the men, and from that day forward there was no need for the slightest apprehension, either that the soldiers would not deal tenderly or that the people would not welcome them: not a complaint was ever preferred."

Close of the operations.

From this time onwards the epidemic steadily decreased, and the operations, the gradual and cautious introduction of which have been described, were carried to their successful conclusion.

## HYDERABAD.

Course of the epidemic.

In Hyderabad very thorough measures were adopted almost from the outset. After the occurrence of a number of dropping imported cases local cases began at the end of February, there was a considerable increase in the number of cases in the middle of March, and a still great increase at the beginning of April. The disease reached its height in the middle of that month, and the last case occurred on the 2nd of June.

Organisation.

At the end of January, house-to-house inspection was commenced by Municipal officers, and in the middle of February, the town was divided into eight divisions, each in charge of a European officer, the Military officers cordially volunteering to assist. Each

Divisional officer had working under him one or two Sub-divisional officers, who were mostly Municipal Commissioners. The efforts of these officers were directed to cleaning and limewashing the 12,000 houses that composed the town.

Segregation of the sick.

At the very first the imported, cases were as a rule treated in their own houses, the necessary precautions with regard to the house, bedding, etc., being taken after the termination of the case. The Collector, however, insisted on more thorough measures: the isolation of the sick and the segregation of the family and attendants. If the sick person was not too ill to be moved, he was taken to the sheds out side the town, and the rest of the family were also segregated in the sheds. On the 23rd of February the Collector caused the migration of about one hundred families from a group of houses where cases had been increasing in number.

Segregation of the inmates of infected houses.

When local cases began to increase, the supervising staff of Civil and Military officers was considerably augmented and every effort was made to stay the epidemic. The sick were removed to hospital, and the inmates of infected houses were carefully segregated in a camp outside the town. The occupants of houses surrounding the infected house for a considerable area were also removed. Mr. Wingate states that the use of this last measure was proved by the great quantity of dead rats afterwards discovered in the shops and houses opened for cleaning. "Had the inmates been sleeping in the rat-infected rooms, the mortality would in all probability have been severe, whereas as inmates of the camps they altogether escaped."

Private hospital.

Mr. Diayaram Gidumul established a private hospital on the native library premises, and entrusted it to the superintendence of the Revd. A. Canney, of the Church Missionary Society, and Miss Pigott, of the Zenana Mission. By his request, Surgeon-Lieutenant-Colonel Henderson undertook the general medical supervision. A Committee of native gentlemen supplied every thing that was necessary. This private hospital was opened on the 19th March, and on the 24th of the same month the Government High School buildings were opened as a general plague hospital under Surgeon-Lieutenant-Colonel Henderson, assisted by nurses obtained from Calcutta. Both hospitals were closed on the 15th June.

Public hospital.

Appointment of a Plague Committee.

In the beginning of April plague broke through the barriers; cases trebled and the mortality doubled. On the 9th of the month a Plague Committee was appointed by the Government, consisting of the Collector (Chairman); Dr. Henderson; Major Price, Commanding the station; Surgeon-Captain Cater Jones; and the President of the Municipality. Mr. Wingate states that the Committee did admirable work and promoted united and well considered measures.

Health camps.

"The camps were brought under control of European soldiers and non-commissioned officers. These camps had been carefully laid out and very systematically worked by Surgeon-Captain Cater Jones, who devoted himself to the efficiency of their management and the comfort of the inmates. Tickets showed the occupants of each hut, with full particulars, so as to avoid constant reference by the inspecting officer to the registers which were kept in the camp office; the observation sheds for any sickness, disinfectants, provision arrangements were all well ordered."

Close of the operations.

Soon after the Committee was appointed, the disease began to abate, and the Committee carried the operations through the period of rapid decline which ended in the extinction of the epidemic in the beginning of June.

## SUKKUR AND ROHRI.

Situation and importance of Sukkur and Rohri.

Sukkur and Rohri form practically one town and are connected by the Lansdowne Bridge over the Indus. Railway lines run from them to Hyderabad, to Karachi, to the Punjab, and to Shikarpur and Baluchistan. "A more dangerous spot for an outbreak of plague," says Mr. Wingate, "could hardly be named, and with the large important town of Shikarpur, teeming with Karachi, Hyderabad, and Sukkur fugitives, and having business connections all over India and as far as Bokhara in Central Asia, situated within twenty-five miles of Sukkur, the progress of the epidemic was watched with the keenest anxiety, and the resources of the province were strained to check its apparently resistless march northwards."

Opposition excited by compulsory segregation.

The first events connected with the enforcement of plague precautions in Sukkur are of great interest as showing the disastrous results arising from the population combining, owing to their dread of segregation, to frustrate the efforts of the authorities. The following is the account given by Mr. Wingate:—

"On the 17th February, a report was received from the Civil Surgeon, Sukkur, Surgeon-Major Corkery, stating that a case of plague was reported on the 12th idem, and in the face of great opposition he had removed the patient, a girl of 10 years old, accompanied by her mother and brother, to the shed prepared for such cases. Dr. Corkery disinfected the house. This was the first case of plague reported from Sukkur, and the first case of forcible removal of a patient anywhere. The result is significant. Ominous silence followed, and soon it appeared that the people of all ranks had banded themselves together with one accord to defeat the authorities. On the 26th February, Dr. Corkery reported that, besides the one case which he saw and removed, a few suspicious fatal cases had

Concealment of cases.

occurred which were not brought to notice and which the relatives had palmed off as deaths from natural causes. A very large number of the population immediately deserted Sukkur. There was a rush of the healthy to Shikarpur, but the measures there and in other big towns were more or less dreaded, and the bulk of those who had sick in their families—and there appear to have been many—fled to the neighbouring villages. The country is well cultivated in that part of Sind, and villages are pretty close together. A day or two after the removal of the girl, the sister-in-law of a Municipal Commissioner took the disease and was immediately secreted in a village five miles off, where she died—poor creature—"possessed of the devil," as her brother-in-law pleaded. How many perished in these villages before their condition was known and help could reach them it is difficult to say, but in the Sukkur Taluka the excess of reported deaths over the normal was 436. The fugitives also crossed over to the left bank of the Indus, and infected Rohri and the villages in its neighbourhood. Some 10,000 people are said to have thus suddenly decamped. Flight of inhabitants.

"Surgeon-Major Corkery set himself to find out the truth. He traced one family to Rohri, where 4 deaths occurred: spies were placed over a suspected lane in New Sukkur. A sick man was caught as he was being placed in a boat with a temperature of 105° and delirious. This was on the 25th. Next day, the 26th February, the same date on which the first two local cases occurred at Hyderabad, a search was made in the lane. One dead boy and two sick were found, and these were removed to the isolation sheds, and the other inmates to the health camp. There was only slight opposition. Clothing and bedding were burnt, and the houses fumigated and locked. It is to be regretted that the Municipal Commissioner of Sukkur lent no assistance. Detection of concealed cases.

"Sukkur, like Karachi, showed no imported cases. All were local, and, though Karachi people went to Sukkur, none were traced to have died of plague. By the 12th February, when the girl was discovered, there must have been a good many sick in Sukkur to give rise to the panic that followed her removal. In the neighbouring town of Shikarpur, plague measures aroused no panic, because the townspeople had no sick in their households." Existence of many cases.

Surgeon-Major Baker was sent to Sukkur to assist Surgeon-Major Corkery. He arrived on the 8th March and reported on the 12th that he had found two plague cases in the isolation camp, and twenty persons in the health camp, one of whom had just developed plague. Old Sukkur, where the wealthier portion of the community

lived and which is separated from New Sukkur by the European and railway quarters, was not deserted to any appreciable extent, but three-fourths of the inhabitants of New Sukkur had left for the surrounding villages.

**Desertion of New Sukkur.**

**Increase of supervising staff**

On the 28th March Surgeon-Major Baker presented a report which showed that the local organization was not abreast of the disease. The supervising staff was immediately increased. The chief difficulty that had been experienced was want of labour, due to the panic and flight of the inhabitants. To overcome this obstacle from two to three hundred trained Karachi labourers and masons, under supervisors, were at once despatched from Karachi, with a supply of corrosive sublimate. At the same time 30 British soldiers of the Duke of Edinburgh's (Wiltshire) Regiment were sent from Hyderabad. On the 30th March a Plague Committee was appointed for Sukkur and Rorhi, with Lieutenant-Colonel Mayhew as President, and Mr. Lucas, Dr. Corkery, and the Secretary to the Municipality of Sukkur, as Members.

**Trained labour sent from Karachi.**

**Military assistance.**

**Plague Committee appointed.**

**Improvement in the situation.**

With these improvements in the administration the work was soon brought into order, and Mr. Wingate states that the visits he paid to Sukkur during April and May showed that there was little to do, "but be thankful that so fine a body of officers had been provided, animated with the one mind to clear plague from the Province and suspicion from the people."

**Accommodation for the sick.**

"At Sukkur, as elsewhere, the sick were accommodated in some of the best buildings in the town, the Schools having been placed freely at disposal by the Educational Inspector, and the best comforts and nourishment that could be procured were provided, while the nursing was that of the motherly sisters of the Lady Aitchison Hospital, Lahore, generously spared and eager for the service, assisted by the Zenana Mission Ladies."

**Nurses.**

**Extension of evacuation and camp system.**

At the same time the evacuation and camp system was largely extended. The heat of Upper Sind interfered with the comforts of the occupants, but the buildings were made as substantial as possible. The authorities of the North-Western Railway gave valuable aid. "It suggested itself to them to utilise sleepers, and huts made by sinking sleepers in the ground, and across these uprights supporting a roof of sleepers covered with mud, were multiplied by the hundred at little expense. Water was laid on to the camps, and paved and enclosed bathing places provided; shops moved themselves bodily in, and with a few screens for the better classes life was bearable."

**Cleansing and disinfection.**

"The inhabitants of these camps were detained for thirty days to permit Mr. Cadell, who commanded the disinfecting gangs, to finish

the work of house-cleaning, so that when the population returned, not a nook or corner had escaped the perchloride of mercury; and not a rag or rubbish heap remained; while walls inside and out shone with lime wash, with which disinfectant had been mixed; and light and air penetrated to the darkest recesses through holes in walls and roofs."

Rohri.

Notwithstanding a careful watch at the bridge plague spread from Sukkur to Rohri. Here the arrangements were under the immediate control of Mr. Mountford, the sub-divisional officer, who was assisted by three Military officers. Mr. Wingate states that the arrangements were admirable. With the aid of Hospital Assistants the sick were treated in sheds under trees and made as comfortable as possible. The disease was held thoroughly in check and the bulk of the population remained. "Mr. Mountford went on the plan of emptying thoroughly particular streets. He always got good information of sickness, and carried the sensible part of the townsfolk with him."

Evacuation of infected streets.

## VILLAGES IN THE SHIKARPUR DISTRICT.

General account.

The following brief account given by Mr. Wingate of the work in villages in the Shikarpur District offers another striking instance of the salutary effect of evacuation, disinfection and cleansing:—

"Mr. Lucas' hands had been strengthened by a strong contingent of officers. Plague had to be kept out of Shikarpur, and should it get a footing there, it was desired to have officers, ready to put into the town, and plague had to be beaten back, if that might be possible, from the Punjab frontier. The frontier station is Reti. At Dharki, the next station south and only some 15 miles from the boundary, a sudden and sharp outbreak occurred—34 cases and 24 deaths in all. Surgeon-Major Baker and Mr. Mountford, I.C.S., the Assistant Collector in charge of the taluka, were on the spot immediately. Some good work had had already been done by the local authorities and the people had segregated themselves under trees. A disinfecting gang was organised, all the inhabitants removed, the houses systematically cleaned, the people replaced and the public health restored. Mr. Pringle had been moved up from Hyderabad, and was again selected for the duty of clearing plague out of the villages in the Sukkur taluka. Mr. Lucas had done a great deal of preliminary enforcement of orders by special plague inspectors. Mr. Pringle, after visiting every village, was able to confirm the intelligence that plague was in May confined to two villages in the Sukkur taluka and had never been local in more than three or four. These two villages gave some trouble, but yielded eventually to

Outbreak at Dharki.

Evacuation and disinfection.

the effective method of turning out the population and disinfecting and cleaning the houses, and after the re-occupation there were no more cases. This sounds easy, but May in Upper Sind represents the worth of the workers who stayed not to rest till their task was done. The result of the Gharibabad exodus was widely known, and the villagers quietly accepted the same remedy."

## HEALTH CAMPS.

Mr. Wingate's memorandum.

The invaluable memorandum written by Mr. Wingate on the 30th July on the subject of the effect on the disease of the evacuation of infected localities and the removal of the inhabitants to temporary health camps forms an appropriate close to the account of the measures adopted in Sind. It was the measure that specially characterized the Sind administration and was signally successful in its results. It is not too much to say that the removal, after disinfection, of the inhabitants of an infected locality to a carefully supervised health camp, combined with the thorough cleansing and disinfection of the locality before the return of the inmates, affords a means of staying the disease which is practically certain in its effect. No more valuable lesson was furnished by the history of the vast organisation formed in India to meet the crisis.

Evacuation of infected localities the special characteristic of the Sind system.

Variations in the conditions of different camps.

The following is Mr. Wingate's account :—

"The figures of cases and deaths due to plague among the inhabitants of camps which have been regularly furnished to Government are misleading in this way that no distinction has been drawn between camps regarding the degree to which the inhabitants were exposed to infection or were liable to contract the disease during their residence.

No disinfection or segregation in the Nasarpuri Camp.

"Take for an instance the Nasarpuri Camp, the first that was established. The huts were new and the locality healthy. The population were permitted to enter the camp carrying with them their sick, their dirty clothes and all their belongings. They were permitted to go daily to their work, and to have such intercourse as they pleased with the rest of the town, and no restrictions were placed upon other persons entering the camp. Add to this that the sick were not segregated from the healthy, the survivors after death were merely placed in a new hut with their belongings, the hut in which death occurred and the clothes and bedding of the deceased only being burnt, and it is then a matter for surprise what an effect the mere removal of the inhabitants had. The Nasarpuris belonged to an influential and well-to-do class, and it was a matter of importance

in the early days of the plague to induce the population to move voluntarily. The Nasarpuri Camp opened with a population varying from 2,500 to 3,000 during the first two or three weeks following the 24th January and closed with a population of nearly 1,000 at the end of May. The total numbers of cases and deaths during these five months were 97 and 80, respectively, of which 38 cases and deaths occurred within the first fortnight. Results in the Nasarpuri Camp.

"The following examples, however, of camps instituted when the organization was complete show the results which followed strict segregation and supervision. The village of Kalankot in the Trans-Lyari quarter had a record of 42 cases and 33 deaths between the 7th and 10th March in a population of 900 roughly. The village was entirely evacuated on the 17th March and the inhabitants placed in huts 500 yards away. They were not disinfected before entering the camp. The following words are quoted from the Collector of Karachi's report:— Camps with strict segregation and supervision. Kalankot in Karachi.

"'The sick were segregated, but there was no disinfection; 19 cases occurred during the first eight days (*i.e.*, within the ordinary incubation period), after which the disease completely disappeared, except one case, which was traced to infection from outside and occurred six weeks after the move.'

"On the 1st and 2nd May the inhabitants of a village, called Gharibabad, in the Trans-Lyari quarter, were located in the same camp which the Kalankot population left two days previously to return to their homes. The Gharibabad population of 849 was thoroughly disinfected before they were admitted into the huts. On the 3rd May two cases of plague were found, and none occurred afterwards. Twelve cases had occurred in Gharibabad village during the week previous to removal. Gharibabad in Karachi.

"A small village of 170 Mekranis, who were badly infected, were placed in huts on the Trans-Lyari side on the 4th May after thorough disinfection. No further cases appeared among them. Village near Karachi.

"A small nest of tumble-down houses, known as Nagarbai's compound, became infected. The inhabitants, about 200, were disinfected and moved into a camp not more than 100 yards away. There had been 28 cases and 18 deaths in the 20 days prior to the move, including 4 cases and 3 deaths on the day previous to and one on the day of removal. Only one case occurred three days after removal. Small nest of houses in Karachi.

"Plague broke out in Kiamari in February. On the 20th February the disease appeared in the old native village, where it remained till April, when the whole population was turned out and the village burnt. What is known as the new village was treated in the same way. Kiamari in Karachi.

"'Scarcely a hut in this area,' writes the President of the Plague Committee, 'inhabited by 1,300 persons could be declared free from infection. The Kiamari Health Camp of 255 huts, with all necessary sanitary arrangements, having been built and the camp placed under a military guard, the healthy persons were, after careful medical examination, moved into it from the infected village. Before being allowed to enter the Health Camp all persons and their belongings were most carefully disinfected by European subordinates under medical supervision. * * * * After removal to the Health Camp only two cases of plague occurred among these people. * * * * * No local case occurred in the Kiamari Health Camp.' The two cases appear to have been due to infection from outside, workmen being attacked who were permitted to leave the camp by day on passes and were disinfected before re-admission at night.

"Two more examples may be given, in conclusion, from Sukkur:—

**Gharibabad in Sukkur.**

'On the 17th April a quarter of New Sukkur, known as Gharibabad, where 106 cases had occurred in the previous three weeks, was surrounded, and the inhabitants *en masse*, to the number of about 600, were conveyed, with their goods, poultry and domestic animals to two camps of huts made of railway sleepers. Of these 367 were taken to the Gharibabad Health Camp. One case was found in this camp on the day of removal, and not a single other case occurred during their stay of one month. It may be mentioned that 5 cases and 2 corpses were found in the Gharibabad quarter on the day the inhabitants were removed. Exact information cannot be given regarding the remaining 215, who, being railway employés, and their families were sent to a Railway Loco. camp, which contained 1,100 persons, among whom from first to last 6 cases and 4 deaths occurred.'

"The following is quoted from the report of the Sukkur Plague Committee:—

**Small quarter in New Sukkur Town.**

'A second case worth recording is that of the Limji Charhi* people. This neighbourhood was also badly infected for at least a fortnight prior to the 26th April, 4 and 5 cases occurring daily among a somewhat limited population. * * * * The residents of this quarter were removed *en masse* on the 26th April to a camp specially set apart for them. * * * * Not a single case occurred amongst them for the month they were in camp, and since their return to

* A small quarter in New Sukkur Town.

their quarter they have been absolutely free from infection. The number of persons removed was 232.

'On the day of their arrival in camp their clothes and bedding were disinfected by boiling; rags and dirty bedding were destroyed * * * and their beds and furniture disinfected with perchloride solution.'

"Examples might be multiplied. At the New Sukkur Segregation Camp 11 cases and 7 deaths occurred among 529 people, drawn from the most virulently infected parts of Sukkur Town. In the report of the Plague Committee it is stated that of these cases— New Sukkur Segregation Camp.

| | | | | | |
|---|---|---|---|---|---|
| 1 occurred | ... | ... | ... | 1 day after admission. | |
| 1 " | ... | ... | ... | 2 days | " |
| 4 " | ... | ... | ... | 4 " | " |
| 1 " | ... | ... | ... | 5 " | " |
| 1 " | ... | ... | ... | 6 " | " |
| 1 " | ... | ... | ... | 7 " | " |
| 1 " | ... | ... | ... | 11 " | " |
| 1 " | ... | ... | ... | 13 " | " |

The last case was a doubtful one.

"The examples which have been given are those which point most conclusively to the efficacy of segregation after disinfection and supervision in stopping plague in an infected population. Enquiries are still in progress regarding caseswhich may have occurred under similar conditions after ten days' residence in camp. The evidence that plague does not incubate more than a few days is so strong that it may be considered that cases like the one that occurred after eleven days in the New Sukkur Segregation Camp are capable of explanation, and the simplest seems to be the supposition that in such cases the infection was taken from a previous case in the camp." Efficacy of segregation after disinfection.

## General Remarks on the Disinfection of Houses.

A solution of corrosive sublimate (strength 1 in 1,000) was the agent commonly used for disinfecting houses. It was found to be the most convenient and to give the best results. The following Use of corrosive sublimate solution.

summary of its advantages is taken from a report by Surgeon-Captain Dyson, Deputy Sanitary Commissioner, Gujarat :—

Its advantages.

(*a*) It is simple, cheap and efficient, and secures a great saving of time and labour. Further experience will probably show that a weaker solution (1 to 2,000) is sufficiently strong.

(*b*) It ensures almost complete immunity from infection to labourers.

(*c*) It entails a minimum of discomfort and inconvenience on the occupants of a house.

(*d*) Perchloride of mercury is odourless and non-volatile.

The former quality recommends it to natives, and the second gives a greater chance of a permanently good effect.

Mr. Hankin's experiments on the floors of houses.

Mr. Hankin conducted a series of important experiments on the action of different disinfecting agents under the ordinary conditions of an Indian dwelling. The following is a summary of his method and conclusions :—

The floor the portion of the house most in need of disinfection.

"Owing to the fact that the excreta of men and rats suffering from plague are likely to fall on to the floor of houses, and that such excreta are likely in some, but not in all, cases, to contain the plague microbe, and owing further to the probability that the infection of plague gains entrance to the human body in the majority of cases through the skin of the feet and legs, it is probably the floor of the house that is most in need of disinfection. The floors of houses of the lower classes in India are usually covered with a mixture of mud and cow-dung. My experiments therefore have been in the first place directed to examining the means of disinfecting such floors. The most satisfactory way of carrying out such a test would be to impregnate a cow-dung floor with the microbe of plague, and then to test for its presence after the application of the disinfectant. Unfortunately, however, this is at present impossible as no reliable test exists for the presence of the plague microbe when mixed with others. Hence I have had to experiment with floors that had not been infected. By estimating the numbers of ordinary microbe present before and after the application of the disinfectant some idea can be formed of the activity of the latter on a cow-dung floor. No doubt some of the microbes present are more resistant than the plague microbe to the action of disinfectants; others, on the other hand, are likely to be as sensitive, and hence it would probably not be safe to employ a disinfectant against plague that had no action

Principle of the experiments.

in decreasing the numbers of harmless microbes present on an ordinary floor.

Method.

"The method I have employed was to remove as much of the material of the floor as could be taken up on the end of a flattened needle. This was put into a test tube containing melted agaragar, mixed up well with the food medium, and the mixture was then allowed to solidify. On the following day the number of colonies that had developed was counted. It is needless to say that this method does not give results of any absolute value. If, for instance, the material of the floor was dry, it is likely that most of the microbes present in the specimen removed for examination would adhere to the particles of sand and dirt, and that each particle would produce only a single colony. If, on the other hand, the particles were damp, it is likely that the microbes adhering to them would more readily become suspended and distributed in the agaragar and thus produce a large number of colonies. Though the method has no absolute value, it has some relative value, if repeated sufficiently often. If a specimen taken before disinfection produced a great number of colonies and a specimen taken after disinfection produced no colonies after 24 hours, we may infer that some disinfectant action has been exerted. It would not be safe to conclude that the specimen taken after disinfection was absolutely sterile, for microbes might be, and as a matter of fact were always, present that could not produce colonies after 24 hours, but that did so after a longer interval."

Experiments in the Hardwar laboratory.

"Experiments to test the action of different disinfectants were carried out on the mud floor of the grass hut that served me for a laboratory in Hardwar in the following manner:—The floor had been covered with the ordinary mixture of mud and cow-dung some days before. Areas about a foot square were divided off from each other by ridges of earth. Two specimens of the mud mixture of each area were examined bacteriologically as described above before pouring on the disinfectant. The disinfectant to be tested was then poured on to the surface, so that the whole of it was wetted, but no attempt was made to rub it in. After this, at different intervals other specimens were taken and tested. In every case two specimens were taken from different parts of the area. The figures in the following table give the average of the two results. For the sake of clearness I have not given the actual number of colony-producing microbes found, but I have given the relative numbers that developed for every hundred colonies found in the control observations. For instance, for every hundred colonies present before treatment with sublimate, half an hour afterwards only 60 were present, and 24 hours

Results

later the relative number had risen to 130 as shown by the first line in the table :—

| Disinfectant. | Before treatment. | After ½ hour. | After 1 hour. | After 2 hours. | After 24 hours. |
|---|---|---|---|---|---|
| A. Sublimate 1 in 1,000 ... | 100 | 60 | 55 | 40 | 130 |
| B. Sublimate 1 in 1,000 *plus* hydrochloric acid 2 in 1,000 | 100 | 0 | 43 | 0 | 1 |
| C. Chloride of lime 1 per cent. | 100 | 0 | 112 | 63 | 315 |
| D. Potassium permanganate 1 per cent. ... | | | | | 86 |
| Sulphuric acid 1 per cent. | | | | | |
| Permanganate and sulphuric acid each 1 per cent. ... | | | | | |
| The same mixture diluted ten times ... ... | | | 47 | | 112 |
| H. Sulphuric acid 1 in 250 | 100 | | 63 | | 112 |
| I. Sulphuric acid 1 in 500 ... | 100 | | 140 | | 300 |
| J. Sulphuric acid 1 in 500 *plus* permanganate 1 in 1,000 ... | 100 | | | | 161 |
| K. Phenyle 1 per cent. .. | 100 | | | | 138 |
| L. Lysol 1 per cent. ... | 100 | | | | 220 |

**Deductions.**

"After addition of the disinfectants, the treated areas were protected from dust by means of covers placed over them. It will be noted that the only substance tried that produced anything approaching a complete disinfection was corrosive sublimate in an acidulated solution. Chloride of lime, phenyle, and lysol appear to be without much action on the microbes of a cow-dung floor, although as is known they are energetic disinfectants of microbes suspended in test tubes of bouillon. A comparison of experiments D, E and F shows that a mixture of permanganate and sulphuric acid acts more strongly than either of these substances alone. The same deduction can be drawn from experiments I and J. As already explained, moistening a cow-dung floor is likely to lead to an increase of the number of colonies that will appear in these experiments. The specimens taken before treatment were obtained

from the floor while it was dry. Those taken after treatment were taken when it had for some time been moistened with the disinfectant solution. This is the most probable cause of the increase in the number of colonies developed after addition of the solution of phenyle in experimnt K."

Experiments at Hardwar and Kankhal.

Similar experiments with disinfecting agents were carried out with a like result during the disinfecting operations at Hardwar and the neighbouring village of Kankhal.

Disinfection by fire.

Experiments with fire were found to give the best results. Complete disinfection was produced by burning a layer of grass two inches thick on a surface of earth under the shade of a tree. The experiment was also tried with apparent success in a tenement in Bombay inhabited by policemen; grass was burnt all over the floors and no more cases of plague occurred. "Though the method can thus be carried out with the help of intelligent supervision, it would probably lead to accidents, if employed in a town on a large scale. In most cases, however, it can be used in public latrines, which are frequently made of corrugated iron or other incombustible material. Both on the general grounds that human excreta are apt to contain the microbe of the disease, and on the *a posteriori* evidence of the Hong-kong epidemic, it is probable that public latrines may become sources of infection and consequently are greatly in need of efficient disinfection. Owing to the existence of caste and other prejudices the disinfection of public latrines is very often shirked. Further, if ordinary disinfectants are used, it is not easy for an inspecting officer to know whether the work has been properly carried out. Hence I suggest that public latrines in infected areas should be frequently treated with burning grass or other fuel. The sweeper could put a bundle of grass on to each compartment and light it. Afterwards the ashes could be washed out with a dilute solution of sulphuric acid."

Disinfection of latrines by fire.

Duration of the action of different disinfectants.

A matter to which Mr. Hankin attached considerable importance was the duration of the action of the disinfectant "whether in other words its employment is likely to make the medium unsuited for a considerable time for the life of the bubonic microbe."

"This is possibly more important in the case of bubonic plague than with other diseases. Not only in this disease is a disinfected area liable to be re-infected by human patients, but in addition in many cases this may occur through the agency of infected rats. Hence a disinfectant that merely destroys the microbes present at the time, and that has no lasting action is not sufficient for the purpose. As shown by previous experiments, acidulated sublimate solution is the only one of the disinfectants tried that showed a

clearly good action on a cow-dung floor. Unfortunately, however, solutions of mercuric salts, even with the addition of volatile hydrochloric acid, are by no means stable, especially when mixed with the material of a cow-dung floor. Dilute sulphuric acid on the other hand is not volatile, and if used in sufficient quantities is likely for some time at least to make the floor an unsuitable nidus for the bubonic microbe. Although, as shown in previous experiments, there are many microbes in a cow-dung floor not readily affected by it in the strength recommended, the special sensitiveness of the bubonic microbe to acids in general and to sulphuric acid in particular makes it likely that the latter substance will be efficient when used on such a floor. The acid will slowly diffuse to the deeper layers and combine with calcium salts and various alkaline substances that may be present. But the upper layers which are in most need of disinfection are most likely to be affected, and the acid will be less quickly neutralized if the floor has been treated with acid sublimate solution on the preceding day. In a locality in which the soil is highly calcareous, sulphuric acid is not likely to be a convenient disinfectant for cow-dung floors."

**Sulphur fumigation not reliable.**

Mr. Hankin came to the conclusion that sulphur fumigation cannot be relied on to destroy microbes. "Experiments carried out by the German Health Officer," states Mr. Hankin, "have shown that though gaseous disinfectants may destroy the microbe in experiments on a small scale, they will not do so in large rooms as the gases do not show sufficient penetrative power." He carried out two experiments which confirmed this conclusion.

**Disinfection by oxidation.**

Mr. Hankin recorded the following remarks on disinfection by oxidizing action of the atmosphere and by oxidizing agents :—

"A further consideration bearing on the choice of an antiseptic depends on a view that is generally held by those having experience of plague, namely, that the virus is sooner or later destroyed by ventilation. As I have elsewhere shown, the plague microbe is somewhat resistant to the action of drying, and hence it is difficult to believe that the asserted benefit of ventilation is only due to dessication tending to destroy the microbe. Its action is more likely to be due to the oxidation processes that are produced by the evaporation of water in the presence of air and light. Many authorities have brought forward reasons for believing that the destruction of microbes through the action of light is in reality due to an oxidation process. Microbes are found not to be destroyed by light when exposed to it under condition in which oxidation processes cannot occur. My experiments have further shown that the bubonic microbe is very susceptible to the action of such oxidizing agents as chloride

of lime and permanganate of potassium. If the evidence in favour of the use of ventilation is considered to be sufficient to justify the costly and troublesome method of removing the roofs of houses, and if the good effects of ventilation are admitted to be due to oxidation, ought not cheap and convenient oxidizing agents such as permanganate of potassium to be used in combating the plague? Unfortunately in the case of cow-dung and mud floors it is not likely to be practicable to employ sufficient permanganate to produce the effect desired. It might be possible in better built houses with cement floors. Permanganate might be used in water suspected of being infected, such as water used by dhobies for washing infected clothes. But owing to the risk of insufficient quantities being employed, it would be most objectionable to put it into the hands of unskilled workers for ordinary purposes. I have shown above that a mixture of sulphuric acid permanganate is more active in destroying microbes than either of these substances used separately. Such a mixture would have the further advantage of removing smells from dwelling rooms, such smells being unaffected by corrosive sublimate. But it must be borne in mind that the sulphuric acid enters into the reaction, and is decomposed with the permanganate. Hence the addition of permanganate to dilute sulphuric acid may diminish the durability of the effects of the latter. Strong solutions of permanganate mixed with dilute sulphuric acid slowly decompose with liberation of ozone. With concentrated sulphuric acid the reaction is violent."

Disinfection should be done twice over.

In view of the fact that the coolies employed in disinfecting work may not carry out the process thoroughly, Mr. Hankin advises that wherever practical the room should be disinfected twice over.

Practical rules.

The following are the practical rules for the disinfection of buildings which Mr. Hankin derived from his experiments :—

"(1) In the case of corrugated iron latrines, isolated pucca buildings, and other pucca buildings in which the work can be done with safety under intelligent supervision, a layer of dry grass or other inflammable material, at least two inches thick, should be laid over the whole of the floor and burnt. Afterwards the whole of the interior of the building should be washed out with a solution containing one part in 250 of sulphuric acid.

(2) In the case of dwelling rooms in which there are definite grounds for believing infection to be present, the whole of the interior should be first washed with a solution of corrosive sublimate of 1 in 1,000 strength to which hydrochloric

acid in the proportion of 2 in 1,000 has been added. On the following day the rooms should, if possible, be washed out with the dilute sulphuric acid.

(3) In the case of dwelling rooms in which there is no actual evidence of infection, but which are being merely cleaned out as a precautionary measure, the dilute sulphuric acid need alone be used. The inhabitants should be advised not to "lepo"* the floors after this has been done, with the unfortunately necessary exception of the part of the floor near the cooking place.

(4) Dilute sulphuric acid should be used in large quantities for washing out passages, courtyards, and surface drains.

(5) In order to diminish the risk of coolies being burnt by having to handle strong sulphuric acid, it should be diluted with an equal bulk of water at the dispensary before being sent out. To make a dilution containing one part in 25, three ounces of strong sulphuric acid, or six ounces of the acid mixed with its own bulk of water, should be added to every "nand" of water: an ordinary "nand" holds nearly four gallons. A rough indication as to whether or not water has been added to sulphuric acid may be obtained by adding pure sugar to some of the acid. If sulphuric acid contains more than 40 per cent. of water, the mixture will not turn black during the next hour. The sugar employed should be slightly moist."

* Smear with cow-dung.

# CHAPTER IX.

## MEASURES OUTSIDE THE BOMBAY PRESIDENCY.

### Preliminary Remarks.

The general orders issued in provinces lying outside the Bombay Presidency and Sind will first be described and an account will then be given of the operations carried out at Hardwar and the neighbouring town of Kankhal in the North-Western Provinces and at Khandraoni in the Gwalior State. Arrangement of subject.

### General Regulations.

#### Preliminary Remarks.

The regulations issued by the Governments of Madras, the North-Western Provinces and Oudh, Bengal and the Punjab under the Epidemic Diseases Act are set forth at length in Appendix IV, and those portions which relate to the prevention of the spread of infection by land will be separately discussed in Chapter X. Regulations reprinted in Appendix IV.

The Government of the North-Western Provinces and Oudh issued its first set of general regulations on the 12th February, and subsequently modified them by a set of regulations issued on the 26th of March. In issuing the second set of regulations the Lieutenant-Governor remarked that representations had been made to him that it would conduce to the smoother working of the rules if the procedure to be followed under them were more carefully and clearly defined. The rules of the 12th February were accordingly reconsidered by the Local Government with the assistance of a committee formed of the Commissioner of Lucknow, the Sanitary Commissioner of the Province, and a number of leading Hindu and Muhammadan landowners and residents. The regulations issued on the 26th March after this reconsideration modified the former rules mainly in the direction of defining and limiting the action of the police, in associating more definitely the proprietors of land and the chief residents in the General Regulations of the Government of the North-Western Provinces and Oudh. Revised Regulations.

towns with the Government officers, and in laying down definite (and in some respect less stringent) rules for the segregation of the sick and of persons likely to be infected, and the disposal of corpses. Both sets of rules are given at length in Appendix IV. They deal first with the measures to be taken in villages and small towns, and then prescribe general rules for municipalities and cantonments.

**Town Committees.**

The rules direct the formation of a committee in each municipality or cantonment for the purpose of assisting the Health Officer. The committee should, the rule states, consist of two members, one a Hindu and one a Muhammadan, for each ward of a municipality or definite portion of a cantonment. Their most important duties are to accompany the Health Officer on his rounds of inspection, to explain the necessity of the sanitary measures, to assist in their execution and to bring to notice any complaint that may be made and any abuse that they may discover.

**First orders of the Government of Bengal.**

The Government of Bengal addressed the Corporation of Calcutta on the subject of the measures to be adopted with reference to the outbreak of plague in Bombay on the 30th September, and suggested that certain measures of precaution and preparation should be enforced. On the 10th of October, when it was believed (erroneously as it subsequently appeared) that a case of plague had been imported from Bombay to Howrah, the Government of Bengal considered it desirable to issue a resolution appointing a Medical Board for the purpose of determining the action to be taken by all executive authorities, whether official or municipal, with the object of preventing and checking the plague throughout Bengal.

**Resolution appointing the Medical Board.**

The resolution directed that all cases of illness believed to be plague should be at once reported to the Board by the Magistrate of the district, or by the Health Officer of the Calcutta Corporation, as the case might be. The orders issued by the Board on matters affecting health and conservancy were to be deemed the orders of the Government and were to be carried out with all possible despatch by the executive authorities. The Board were directed to order the execution of any reasonable measures of precaution, segregation, or disinfection which might appear to be called for. The areas with which the Board had to deal in the first place were stated to be—

(1) The town of Calcutta.
(2) The port of Calcutta.
(3) The municipality of Howrah.
(4) The small municipalities adjacent to Calcutta and Howrah.
(5) The lines of railway.

Special instructions were given with respect to the precautionary and sanitary measures to be carried out in these five circles. As soon

as the Epidemic Diseases Act was passed, the Government of Bengal issued a notification under it charging the Medical Board with the general conduct of plague operations, and directing all municipal authorities to carry into effect the measures prescribed by the Board. In addition to fulfilling these functions, the Medical Board acted as an adviser on plague matters to the Local Government.

**Notification under the Epidemic Diseases Act.**

On the 10th of February a set of general regulations were issued under the Epidemic Diseases Act for the town of Calcutta, and a second set, which practically reproduced the first, for other municipal towns. On the 12th of March further regulations were prescribed for Calcutta and other municipalities. The regulations of the 10th of February were only to come into force if plague became prevalent. Experience in Bombay having shown that it is necessary to adopt the preventive and precautionary measures immediately a case occurs, and that it is too late to wait until the disease has become prevalent, the later regulations of March prescribe the measures to be adopted on the occurrence of even a single case. The regulations (apart from the portions dealing with general sanitary matters and with preparation) were never put into execution, as not a single case of plague was discovered in Bengal.

**General Regulations for Calcutta and other Municipalities.**

These first regulations were admittedly in many respects incomplete and the Government of Bengal considered the question of the issue of more comprehensive rules. A set of revised regulations was submitted to the Government of India with a letter of the 3rd June, and at the same time the question whether segregation in hospital should be prescribed was discussed. Plague having by this time greatly abated, it was not considered necessary to issue any new rules. But when the recrudescence of plague in the Bombay Presidency again imperilled the safety of Calcutta, the Government of Bengal considered it necessary to issue a comprehensive set of rules for dealing with any outbreak that might occur. They forwarded a revised set of draft rules on the 1st November 1897, and the Government of India sanctioned their publication on the 9th of the same month. The rules were mainly based on the North-Western Provinces rules of the 26th March, and also contained many of the provisions of the rules already issued by the Government of Bengal. The Medical Board of the earlier rules was re-named a Plague Commission, and the number of members was increased to eighteen, with the Secretary to the Government of Bengal, in the Medical Department (the Honourable Mr. H. H. Risley) as President. The main function of the Commission was defined to be advising the Government, the district and railway officials, heads of departments, municipalities and district boards, as to the measures to be taken in order

**Draft rules of June 1897.**

**Revised Regulations of November 1897.**

**Bengal Plague Commission.**

**Plague Authorities.**

to prevent the outbreak and spread of plague. As in the case of Bombay, plague authorities were to be appointed to carry out the measures under the control of the District Magistrate. The manner in which the rules deal with the subject of segregation will be described in a later portion of this chapter.

**Punjab rules.**

The Government of the Punjab issued two sets of general regulations on the 8th of March. The first empowered the District Magistrate to adopt the various remedial and precautionary measures which experience had shown to be necessary. The second provided mainly for the immediate report of the existence of cases of plague. With these regulations the Government of the Punjab issued a set of executive instructions prescribing the precautionary measures in detail. On the 19th of June a further set of practical instructions were issued in the form of a circular letter.

**Madras rules.**

The Government of Madras issued on the 5th of February a set of regulations for observance in the City of Madras, and a second set for district municipalities, towns and villages. These rules, though sufficient to meet the existing circumstances and to authorise the adoption of the precautions at the time necessary in the Madras Presidency, were not in some respects sufficiently comprehensive to combat an actual epidemic of plague. The rules for the City of Madras came into force from the date of their issue, the rules for other municipalities were, with the exception of one or two sections not actually brought into force.

**Rules in other provinces.**

General regulations for dealing with plague were also prescribed by the Government of Burma, the Chief Commissioners of the Central Provinces and Ajmere-Merwara, the Agents to the Governor General in Rajputana, Central India, Baroda, and Baluchistan, the Residents at Mysore and Hyderabad, and the Mysore, Hyderabad and Baroda Governments.

**Main divisions of the subject.**

In examining the general regulations it will be convenient to discuss them under the three main heads of—

(1) measures to ascertain the existence of plague cases;

(2) measures to be adopted on the occurrence of isolated plague cases and in plague centres; and

(3) general sanitary measures.

## MEASURES TO ASCERTAIN THE EXISTENCE OF PLAGUE CASES.

**Village registers maintained at police-stations.**

In the chapter dealing with the prevention of the spread of infection by land a description will be given of the measures adopted in the North-Western Provinces and Oudh, Bengal, the Punjab and the Central Provinces for the detection of cases of plague in rural

areas by the maintenance at police-stations of registers of villages in communication with the Bombay Presidency and of persons arriving from the Bombay Presidency.

North-Western Provinces.

In rural areas in the North-Western Provinces and Oudh additional arrangements were made, by employing the police and all other available local agencies, to obtain the earliest information of any cases of plague that might occur. The officers of the subordinate land revenue staff, who are constantly travelling around the villages, were directed to give information to their superior officers of the occurrence of any deaths with plague symptoms. Hospital assistants stationed at villages where there are branch dispensaries were required to watch all arrivals and to report a description of the symptoms, in cases of illness, to the Civil Surgeon of the district. Officers employed on duty connected with the famine prevailing in the North-Western Provinces and Oudh received instructions to ascertain on their rounds whether any cases of plague had occurred in the vicinity. In municipalities householders were required to at once report all cases of plague in their houses, and the illness or death of any person who had been residing in an infected locality. Employers of labour were likewise required to give notice of the engagement of any factory hands from the Bombay Presidency and Sind, and medical practitioners were required to report any cases which they attended and which they had reason to believe were cases of plague. The reports were to be made to the nearest police-station, and the officer in charge of the station was directed to send immediate information to the District Superintendent of Police, the District or City Magistrate and the Health or Sanitary Officer of the municipality or the cantonment. The rules also require the owner or occupier to permit the Health Officer to enter his premises and examine any person believed to be infected with plague, provided that if the person be a female, who, according to the custom of the country, does not appear in public, the examination must be made by female agency.

Bengal.

The Bengal regulations of the 10th February for Calcutta and other municipalities only provided for the report of plague cases by householders. The further regulations for Calcutta published on the 12th March required every medical practitioner and every police-officer or municipal servant who becomes cognisant of a case of plague to report the fact to the Health Officer. The Bengal rules of November 1897 contain provisions similar to those of the North-Western Provinces rules.

Punjab.

The Punjab regulations of the 8th March deal at length with the report of plague cases, etc. In municipalities owners and occupiers of houses are required to report all cases of plague to the police-station and the same obligation is imposed on the eldest adult in houses in rural areas, and on the proprietors and managers of hotels,

rest-houses and other such places. All medical practitioners are required to report the cases they attended. Municipal Commissioners and servants, village-officers, subordinate revenue-officers, police-officers, holders of revenue free land, and pensioners, are directed to report to the police-station all cases of plague that came to their knowledge. Similar arrangements were made for reporting the arrival of persons from the Bombay Presidency and Sind.

**Madras.** The rules for the City of Madras only provide for report by householders. In other localities in the Madras Presidency the obligation is laid on householders and medical practitioners.

**Central Provinces.** In the Central Provinces the rules are similar to those prescribed in the North-Western Provinces and Oudh.

**Corpse Inspection.** The detection of plague cases by the inspection of corpses has been noticed in Chapter II.

## MEASURES TO BE ADOPTED ON THE OCCURRENCE OF PLAGUE CASES AND EPIDEMICS.

**Division of the subject.** This portion of the subject will be discussed under the following heads :—

(1) Treatment and segregation of patients.
(2) Segregation of other persons likely to be infected.
(3) Conveyance of patients.
(4) Disinfection or destruction of infected dwellings.
(5) Disinfection or destruction of contaminated articles.
(6) Payment of compensation.
(7) Disposal of corpses.
(8) Infected conveyances.
(9) Evacuation of infected localities.

### *Treatment and segregation of plague patients.*

**Native opinion on the subject of segregation.** In discussing the measures enforced in the Bombay Presidency the difficulty of this subject has been described. In dealing with it the different Local Governments and Administrations were compelled, on the one hand, to consider the importance of devising means sufficient to prevent sufferers from plague from infecting their surroundings, and, on the other hand, they had to take into account the state of feeling in their respective provinces and the extent to which political disaffection and disorder were to be apprehended from the enforcement of a rule rendering every person suspected to be suffering from plague liable to be sent to hospital.

**Original North-Western Provinces rule.** The original segregation rule framed by the Government of the North-Western Provinces and Oudh, was as follows :—

"If on examination of a sick person in a house or other place within the limits of a municipality or cantonment, the Health Officer

suspects (1) that such person is infected with bubonic plague, or (2) considers that he is actually suffering from bubonic plague, the Health Officer shall, if he considers it necessary, arrange for the removal of such person (1) to an observation shed, or (2) to a temporary hospital established for the purpose and for his detention, dieting and medical treatment therein; also for the removal of the other occupants of the house to segregation huts, tents, or suitable structures constructed at a distance from the town, to be detained under observation for ten days."

Revised North-Western Provinces rule.

The rule in this form was most unacceptable to the Muhammadan and Hindu communities of the North-Western Provinces and Oudh, and in the second set of regulations the arrangements for the segregation of plague patients were considerably modified and stated in much greater detail. The Local Government gave the following description of the modified rule:—

Home segregation allowed.

"Isolation may be effected either in the residence of the sick person or in a segregation hospital or camp. In this matter the Lieutenant-Governor desires to apply to the native community the same rules which will apply to the European community. If, in the opinion of the sanitary authorities, isolation and segregation can be effectively carried out at the sick person's residence, it will not be necessary to remove such sick person to a hospital or segregation camp; but, if isolation and segregation in the sick person's residence is not, in the opinion of the sanitary authority, practicable, then it is essential that such authority should have the power to direct removal to a segregation camp or hospital established in a suitable situation. This segregation camp or hospital may be a suitable house or hut or collection of huts licensed for the use of a particular family; or a suitable house or collection of huts licensed for the sole use of particular castes or classes of the people; or, lastly, a hospital or collection of huts established for the general use of the public by Government. The Government will, whenever necessary, construct such huts or hospitals, or help private persons to construct them. In designing these huts or hospitals particular care will be taken that the customs of the country regarding the maintenance of *purdah* * shall be strictly observed, and that those members of the family who wish to accompany the sick person shall be comfortably accommodated, submitting themselves merely to the sanitary precautions which are required by the rules. It is also to be understood that private medical practitioners of all classes must be allowed free access to the sick who desire their attendance, and that it is incumbent upon no one to submit himself to European medical treatment. Each patient may choose freely his own medical attendant."

Private hospitals.

Private medical practitioners.

* *i.e.*, the privacy of women who do not appear in public.

**Home segregation found impossible at Hardwar and Kankhal.**

In dealing with the epidemics of plague at Hardwar and Kankhal the Local Government did not find it possible to adhere to the principle of home segregation. The evacuation of infected houses and localities and the removal of the sick to special accommodation were found to be essential. These measures were successfully carried out without opposition from the people who were treated with great tact and consideration.

**Removal of plague patients.**

The rules forbade the removal of any person suffering from plague, except for the purpose of taking him to hospital, until six hours after the delivery of notice of the intended removal at the nearest police-station.

**Persons accompanying the sick.**

The principal sanitary precaution to which persons accompanying the sick were required to conform was residence in segregation in the immediate vicinity of the private or public hospital. If any person were attacked by plague while thus segregated the rules directed his removal to hospital.

**Special plague hospitals.**

In April the Lieutenant-Governor ordered the erection of special hospitals containing 56 beds in the larger cities, and from 30 to 32 beds in other places, special provision being made for the privacy of females and families.

**Revised Bengal rule.**

The regulations issued by the Government of Bengal at the time of the recrudescence contain revised rules for the segregation of the sick and infected. The Lieutenant-Governor, after considering the alternatives of home segregation and segregation in hospital, came

**Home segregation not allowed.**

to the conclusion that home segregation could not be permitted on a large scale; it "would multiply the so-called 'hospitals' to such an extent that no effective control could be exercised over the intercourse of plague patients and suspects with uninfected members of the community." The regulations therefore authorize the Health Officer to cause all sufferers from plague to be removed to hospital. But in order to show all possible consideration to the feelings of the upper classes of the native community, the estab-

**Private hospitals.**

lishment was authorized of private hospitals "for particular castes, classes, joint families, or associations of families," the equipment and administration of which must be approved by duly appointed authority. This was an extension of the private hospital system so successfully adopted in the City of Bombay. General Gatacre refused to permit the establishment of hospitals for families and groups of families. He had, however, to deal with an already virulent epidemic, whilst in Calcutta, and in Bengal generally, there was time to make beforehand all arrangements for the crisis, should it arrive. The experience of Bombay had also shown that there is no danger to be

apprehended from the existence of a considerable number of plague hospitals in a large town provided they are properly managed. The following is the full text of the Bengal segregation rules :—

Text of the rul

"(1) If on examination of any person the Health Officer suspects that such person is suffering from or infected with plague, he may cause such person to be removed to a hospital, and may arrange for his detention, dieting and medical treatment therein. He may also cause the other occupants of the house in which such person resides to be removed to a segregation camp and to be detained under observation for ten days. In the case of *pardanashin* ladies a lady doctor shall conduct the examination.

"(2) When private plague hospitals or segregation camps have been provided and fully equipped by or for particular castes, classes, joint families, or associations of families, and the Health Officer, or in Calcutta two members of the Plague Commission empowered for this purpose by the President, have in writing approved of the site, plan, furniture and arrangements for medical administration of such hospitals and camps, sick or suspected persons may, if they so desire and if accommodation is available, be removed to the private hospital or segregation camp constructed for the use of the caste, class or family to which they belong, instead of to a public hospital or camp.

"(3) In both public and private camps and hospitals separate and suitable accommodation shall be provided for females, and in the case of a female who by the custom of the country does not appear in public, her *parda* shall be strictly preserved, both in removal to the camp or hospital and during her stay there.

"(4) The relatives, friends, *hakims* and priests of sick persons shall be allowed free access to them during the day time, subject only to such precautions as the Health Officer may consider necessary.

"(5) Members of the family of a sick person who are in attendance on him may also be admitted to the hospital, whether public or private, provided that they shall sleep in the compound in suitable accommodation provided for the purpose, and not in the hospital itself.

"*Explanation 1.*—It is not necessary that hospitals provided in accordance with this rule should be constructed in remote or inconvenient situations.

"*Explanation 2.*—Persons desirous of taking advantage of clause (2) should at once communicate with the Plague Commission and satisfy that body of their ability to provide adequate hospitals and camps when plague breaks out.

"*Explanation 3.*—Private hospitals and camps may be closed by order of the Plague Commission, if the Health Officer reports that medical attendance and segregation are not maintained to his satisfaction, or that the conditions on which such camps or hospitals were sanctioned are not compiled with."

**Arrangements in Calcutta.**

The Bengal rules further provide for the erection and maintenance of temporary hospitals and segregation accommodation. A plague hospital was prepared at Maniktola, a suburb of Calcutta, subdivided for Hindus, Muhammadans and Christians, and provided with observation and rest camps for each sect. Arrangements were made to provide this hospital, should plague break out, with a staff of two commissioned medical officers, two lady doctors, twelve trained nurses, twenty-four hospital assistants, and menials. Sites were also selected for three other similar hospitals. At the time of the recrudescence a more complete system was organized which divided the town into districts and required thirty-five medical officers for its execution. The Bengal Government stated it could provide ten and asked for twenty-five more to be placed at its disposal should the emergency arise. Twenty-five private medical practitioners were accordingly procured from England and were placed on plague duty in the Bombay Presidency in readiness to go to Calcutta if plague should break out there.

**Central Provinces rule.**

The Central Provinces rule followed the original North-Western Provinces rule.

**Punjab rule.**

The rule framed by the Government of the Punjab was merely an enabling rule and empowered the District Magistrate to require any person infected or believed to be infected with plague to remain in the place specified by the District Magistrate.

**Madras rule.**

The Madras rules require municipal authorities to provide and maintain suitable accommodation for the isolation and treatment of persons suffering or suspected to be suffering from plague. On the occurrence of any case of plague the patient is to be removed to the appointed accommodation, or to be segregated in his own house or any other suitable place, if, in the opinion of the Health Officer, this course can safely be adopted. These measures were successfully carried out on the detection of some imported plague cases.

*Segregation of other persons likely to be infected.*

The adoption of this precaution is subject to much the same difficulty as the segregation of persons suffering or suspected to be suffering from plague.

North-Western Provinces rule

The revised rules framed by the Government of the North-Western Provinces and Oudh state that if it is found necessary to segregate the family or any members of the family of the patient, this should, if possible, be effected in their own house; if not, then the segregation must be carried out in a suitable place chosen by the family and approved by the Health Officer, or in a general segregation camp. Instructions were given to pay strict attention to the seclusion of females and the convenience of the family. Upon the death of a sick person from plague the non-professional persons who had been in attendance upon him were required to be segregated for ten days, in the house or its enclosure if this could safely be done, or if not, in a segregation hut or tent or other suitable accommodation. At Hardwar and Kankhal home segregation was not carried out. The infected localities were completely evacuated, and persons who had been specially exposed to the risk of infection were segregated in camp.

Bengal rule.

In the Bengal rules of November 1897 the segregation of persons likely to be infected is provided for on the same principles as the segregation of the sick. The rule is contained in the extract quoted above. The Health Officer may cause all the occupants of a house in which a case of plague occurs to be removed to a segregation camp and detained for ten days. The establishment of duly supervised private camps for "particular caste, classes, joint families or associations of families" is encouraged.

*Conveyance of patients.*

Bengal and Punjab rules.

This matter is not specially dealt with in the North-Western Provinces rules. The rules framed by the Government of Bengal require the municipal authorities to provide suitable conveyances, painted in a conspicuous manner, for the free carriage of persons suffering, or suspected to be suffering, from plague, and for the free transport of infected clothing, bedding, etc. A similar rule appears in the Madras regulations. The special Punjab rules on the subject of conveyances authorize the District Magistrate to require the proprietor of any vehicle ordinarily employed to carry passengers for hire to convey plague patients or corpses.

*Disinfection or destruction of infected dwellings.*

North-Western Provinces and Bengal rules.

The regulations framed by the Governments of the North-Western Provinces and Oudh and Bengal require householders, etc., to comply with any direction that may be issued by the Health Officer with regard to the disinfection or cleansing of houses, and to permit the Health Officer to enter for the purpose of inspection, opportunity being afforded for the withdrawal of females who do not appear in public.

The Health Officer is also empowered, should he consider it necessary, to himself adopt the prescribed measures of disinfection, etc. By the authority of the District Magistrate huts or temporary structures may be burnt or destroyed if they cannot be properly disinfected.

Punjab rules.

The Punjab rules empower the District Magistrate to order the disinfection or destruction of any building, or part of any building in which any declared or suspected plague case has occurred. A detailed set of instructions for the treatment of buildings and sheds which have been occupied by persons infected with plague is appended to the Punjab Government circular letter of the 19th June.

North-Western Provinces and Bengal rules.

*Disinfection or destruction of infected articles.*

The instructions issued by the Governments of the North-Western Provinces and Oudh and Bengal for the disinfection or destruction of contaminated articles are contained in the same rules as the instructions regarding infected houses and are similar in their purport. Householders, etc., are required to carry out any instructions given by the Health Officer, who is also empowered to himself cause the disinfection or destruction of any bedding, clothing, or similar articles which he may consider to be infected.

Punjab rule.

In the Punjab the District Magistrate is empowered to order the disinfection or destruction of any article that has been in the possession of a plague patient or any other person who has been in dangerous proximity to him. Detailed instructions were issued regarding the method of disinfection.

The disinfection of the clothing and baggage of travellers is discussed in Chapter X.

*Payment of compensation.*

Summary of previous remarks on the subject.

The importance of this subject has been noticed in the account of the measures adopted in the Bombay Presidency and the views held by the Government of India have been explained. It will be remembered that the Government of India stated in a resolution issued in March that persons should not be considered entitled to compensation because it is necessary to destroy property in their possession which is dangerous to the public health, but that in view of the importance of overcoming the reluctance of the lower classes to disclose cases of plague, the authorities should be reasonably liberal in paying compensation for destroyed bedding, clothing, and other effects, when the loss would fall upon poor people to whom it would be a great hardship to bear it.

The rules finally framed by the various Local Governments and Administrations followed this principle, and provide generally for the payment of compensation for the destruction of dwellings, etc., and

of clothes, bedding and other effects. It is laid down in the revised North-Western Provinces rule that on ordering the destruction of a hut or other temporary structure the District Magistrate may award compensation to persons who are so poor as to be unable to replace at their own expense the structure that has been burnt or destroyed. Provision is not specially made in the general North-Western Provinces rules for the payment of compensation for destroyed clothing and other effects, but in the rules regarding the disinfection or destruction of the contaminated baggage of railway travellers it is stated that the medical officer may, if the person is poor, or for other sufficient reason, replace any articles destroyed at the expense of the Government. North Weste Provinces rule

The Bengal Government Regulations of February, March and November authorise the Chairman of the Calcutta Municipality and the District Magistrate (outside Calcutta) to pay compensation to any person who has sustained substantial loss and damage by reason of anything done under the rules, provided that no person may of right claim any such compensation. In a notification issued on the 8th April, the Government of the Punjab directed that compensation may, in the discretion of the officers appointed for the purpose, be paid for the destruction of any article or building. Bengal and P jab rules.

*Disposal of corpses.*

This is another matter in which Local Governments found it necessary to consider carefully the religious feelings and customs of the Muhammadan and Hindu communities. Feelings of native community.

The original rule framed by the Government of the North-Western Provinces and Oudh ran as follows:—

"In the event of death occurring from bubonic plague, the Health Officer shall arrange for the disposal of the body. In the case of a European or Muhammadan, the body shall be buried at least six feet deep and be covered with chloride of lime: the place of burial, if not an authorised cemetery, should be well away from habitations and sources of water-supply. In the case of a Hindu, the body shall be completely and thoroughly burned in an isolated locality in the presence of a responsible official." Original Nor Western Provinces rule.

In the resolution explaining the revised rules issued by the Local Government the following description was given of the rules prescribed with regard to the disposal of corpses:— Revised North Western Provinces rule.

"The friends and relatives of persons who have died of plague will be left to dispose of their dead in accordance with their religious customs, subject only to certain sanitary precautions which do not conflict with the mortuary practices of any religion; but, should

unfortunately deaths from plague become numerous in any city or town, it may be necessary to establish burial-grounds outside cities or towns for the interment of persons who have died of plague and are not cremated. These burial-grounds can be selected in communication with the heads of the community concerned and made over to them by Government.

**Use of quicklime.**

"Exception has been taken to the use of quicklime in burials. The Lieutenant-Governor does not regard the matter as of essential importance. In cemeteries well removed from the inhabited portion of a city and well away from the water-supply the precaution will not be required. In cemeteries situated near habitations the precaution is more necessary. Objections to the use of quicklime seem to be met by a suggestion made to the Lieutenant-Governor by a deputation of the representative Muhammadan citizens of Lucknow, *viz.*, that if used, the lime *should not be allowed to come into contact with the* coffin, *takhta* or corpse."

**Sanitary precautions.**

The main sanitary precautions alluded to in the above passage were in substance that the body must not be removed within six hours after the delivery of notice at the nearest police-station and that the friends of the diseased must obey the directions of the Health Officer as to the time, route and method of removing the corpse to the burial, or cremation place. In the event of the failure of the relatives or friends to dispose of the body, the Health Officer was directed to dispose of it in accordance with the religion of the deceased.

**Rules in other provinces.**

The revised rules issued by the Government of Bengal were similar to those of the North-Western Provinces and Oudh. The Chief Commissioner of the Central Provinces retained the original North Western Provinces rule.

*Infected conveyances.*

**Punjab rules.**

The Government of the Punjab issued a special set of rules on the subject of infected conveyances, and the matter was also dealt with in the general rules of some other of the Local Governments. The Punjab rules are to the following effect. Except under the order of competent authority, proprietors and drivers of public conveyances are prohibited from carrying any person suffering or believed to be suffering from plague, or the corpse of any person who has died, or is believed to have died of plague. Should any such person or body be carried in a public conveyance, then the vehicle may not be used for seven days and must be thoroughly disinfected. Compensation may be paid to the proprietor on account of the disuse of his vehicle and any injury occasioned by the process of disinfection.

*Evacuation of infected localities.*

In the North-Western Provinces and Oudh the Health Officer or Sanitary Commissioner is empowered, with the sanction of the Government, to direct the inhabitants of any street, quarter or other infected portion of a cantonment or municipality to evacuate their houses and to remove to a temporary settlement at a distance from the infected locality. North-Western Provinces rule.

Each householder is permitted to make suitable arrangements for the care of his house and property, and the Government promises to arrange for the watch and ward of the empty houses. After evacuation, the Health Officers are directed to arrange for the thorough disinfection and cleansing of the empty premises, and are not to permit the inhabitants to return until the premises are considered to be free from infection.

These rules were worked with great success during the outbreaks at Hardwar and Kankhal.

The Bengal rule on the subject of evacuation is similar to that in force in the North-Western Provinces and Oudh. Sites have been selected and a scheme prepared for housing persons in the immediate neighbourhood of Calcutta, in the event of any portion of the city becoming infected with plague. Bengal rule. Calcutta.

## SIMPLE INSTRUCTIONS ON THE OCCURRENCE OF PLAGUE CASES IN A RURAL LOCALITY.

In addition to the general set of regulations for municipalities and cantonments, the Government of the North-Western Provinces and Oudh prescribed for observance in rural areas a simpler set of regulations drawn up by its Sanitary Commissioner. These regulations were adopted by the Government of the Punjab, which issued them in the form of executive instructions. The following is an outline of the prescribed precautions. North Western Provinces and Punjab rules.

If plague exists in a village, the inhabitants of all the surrounding villages should abstain from all dealings with that village till the plague ceases. In like manner, in an infected village a family free from the disease should not go near a house in which the disease exists. The sick person should be segregated till he recovers or dies, and the attendants of the sick should be kept apart for ten days. If the patient is living in a large roomy house in which he and his attendants can be kept apart, they should be permitted to remain there.* If not, the patient should be at once removed to a temporary Summary of rules.

* This is in accordance with the general principles of the revised North-Western Provinces and Oudh rules. It has been stated above that in practice complete evacuation of infected houses was carried out in a much more extensive manner in the places in the North-Western Provinces where plague outbreaks occurred.

hut to be constructed of grass screens and erected well away from habitations. The site should be shady and near a well. This well should not, if possible, be used by other people. The sick person's relatives and friends should be permitted to accompany him, provided they remain apart and abstain from communication with other persons in the village. The village authorities should see to the supply of food, fuel, etc. Ample accommodation should be provided for males, females, and families when the house is temporarily abandoned. The landlord and village authorities should see that the measures are carried out without interference with the religious or social customs of the family. The temporary hut and the patient's bed should be burnt when no longer required, and the well should be cleaned out and disinfected. If the house in which the patient is living is a hut of small value it should be burnt; houses of greater value should be disinfected. Upon the recovery or death of the patient, the clothes and bedding of the sick person and his attendants should be thoroughly boiled and then spread out in the sun and wind for forty-eight hours. Clothing and bedding of small value should be burnt. The corpse should be disposed of by the friends in accordance with the usual customs. In the case of cremation, the body should be completely burnt in an isolated place. In the case of burial, the body should be buried at least six feet deep, and the place of burial should be well away from habitations and sources of water-supply.

## GENERAL SANITARY MEASURES.

**Rules issued by Local Governments.**

In addition to devising measures for the detection of cases of plague and for stamping out the disease should it appear in any locality, the various Local Governments and Administrations issued rules for the carrying out of general sanitary measures, and either under these rules or under executive orders much was done to improve the sanitary condition of towns all over the country, thus rendering them less liable to an attack of plague.

**Summary of rules.**

The rules framed by the Government of the North-Western Provinces and Oudh empower the District Magistrate to issue general orders in any municipality or cantonment, that by a certain specified date certain sanitary precautions of a simple nature, such as the limewashing of houses, the cleaning of latrines, the removal of filth and rubbish, shall be carried out. The Bengal regulations of November 1897 adopted these rules and contained further provisions for improving the condition of insanitary premises and for the abatement of overcrowding. The Health Officer may require the householder to have the premises cleansed and to remove obstructions to light and ventilation; in default of compliance the work may be carried out

under the orders of the Health Officer, with the sanction of the local authorities. The Chairman of the Calcutta Municipality, or the Magistrate of the District or the Cantonment authority (in places outside Calcutta) may require the owner or occupier of any overcrowded houses to abate the overcrowding by reducing the number of lodgers, tenants or other inmates, or to vacate the dwelling. In default of compliance, forcible ejectment may be enforced. The Government of Madras prescribed similar rules. In the City of Madras the President of the Municipal Committee, or any officer authorised by him, is empowered to enter upon any premises and summarily execute any work under, or summarily abate any of the nuisances indicated in, sections 313, 314, 321, 322, 326, or 327 of the City of Madras Municipal Act, 1884. The sections named refer to the following matters: keeping filth in an improper manner, allowing sewage to flow into the streets, keeping buildings or land in an insanitary or filthy condition, cleansing and lime-washing buildings, cleansing or filling up tanks or wells. In other municipalities similar authority was given to the Collector of the District or to any one appointed by him for the purpose. The regulations for both the City of Madras and other municipalities in the Madras Presidency contain a regulation similar to that prescribed by the Government of Bengal for the abatement of overcrowding.

Sanitary survey of Calcutta.

The special Medical Board appointed by the Government of Bengal in October 1896, deputed five sanitary officers, to make a sanitary survey of the town of Calcutta. The Civil Surgeon of the 24-Parganas was directed to make a similar survey of the suburban area. The reports submitted by the officers disclosed a state of affairs which can only be described as shocking, and which presented the gravest menace to the health of the population. The Government of Bengal summarised the results of the sanitary survey in the following terms :—

Shocking insanitary condition of Calcutta.

"*I.—Overcrowded and badly built houses.*—In many parts of the town and suburbs both pucka houses and bustee* huts are dangerously overcrowded, and are built in a manner which renders proper ventilation and efficient conservancy almost impossible.

"*II.—Defects of public latrines.*—The public latrines and urinals are faulty in construction ; they are imperfectly cleaned and their number is insufficient to justify even a limited application of the penal provisions of the law in regard to nuisances.

* Collection of native dwellings.

"*III.—Defects of private latrines.*—The private latrines are in many cases so constructed that they cannot be properly cleaned, nor can the conservancy officers get access to them ; and consequently many of them are choked with accumulations of filth.

"*IV.—State of house-drains and down-pipes.*—The house-drains and down-pipes are in many cases broken, choked, and out of repair.

"*V.—State of surface drains.*—The surface drains are blocked with foul matter, latrines are allowed to discharge into them, and the drains themselves are often used as latrines.

"*VI.—Neglect of road scavenging.*—The scavenging of the roads is imperfectly carried out ; the staff is inadequate for the work ; and the subsoil has become dangerously polluted.

"*VII.—State of compounds and courtyards.*—The condition of the compounds and courtyards of houses is in many cases extremely filthy.

"*VIII.—Pollution of wells.*—Wells in courtyards are contaminated by the percolation of sewage impurities from the soil.

"*IX.—State of cowsheds and stables.*—Cowsheds and stables are situated in thickly populated places : their construction is faulty ; they are greatly overcrowded, and their flooring is soaked with sewage, which pollutes the wells on the premises.

"*X.—State of hackney carriage stands.*—The number of hackney carriage stands is wholly insufficient to meet the current requirements of the town, and they are imperfectly flushed and cleansed.

"*XI.—Condition of bustees.*—Bustees are badly drained and imperfectly ventilated ; the huts are too close together ; the latrine arrangements lead to the pollution of the soil ; the roads and lanes are too narrow, and conservancy is imperfectly carried out."

**The Governments of India and Bengal consider the situation very grave.**

After reading the report on the sanitary inspection the Government of India informed the Government of Bengal that they viewed the position with grave concern, and that they fully agreed with the view expressed by the Lieutenant-Governor (Sir Alexander Mackenzie) to the Medical Board, that it constituted a standing menace to the health of Calcutta. The remarks made in previous chapters of this report on the paramount influence of insanitary conditions in fostering the growth of plague epidemics indicate the

extent to which the danger of the spread of plague to Calcutta was increased by the filthy and unwholesome state of the city.

Cleansing of the city.

In this emergency the Government of Bengal found it necessary to adopt drastic measures. In the first place, with a view to the remedy of the more glaring and dangerous evils, a special appointment of Chief Superintendent of Conservancy in Calcutta was sanctioned by the Commissioners of the Corporation early in the month of October, and Dr. Banks, who had gained large experience of practical sanitation as Civil Medical Officer of Puri (the great pilgrim centre), was appointed to the post. His duties extended over a little more than six months, during which he was constantly engaged in supervising the conservancy arrangements of the entire town, and in directing the work of the extra conservancy staff appointed by the Commissioners on the 25th September, and largely increased in January under strong pressure from the Local Government. The total extra staff after its expansion consisted of—

| | |
|---|---|
| 2 Superintendents. | 13 Sub-Inspectors. |
| 1 Inspector. | 1,500 Coolies. |

343 Carts.

During the six months this extra staff removed 10,722 tons of neglected filth, not including enormous quantities of night-soil removed to the depôts from privies, which though connected with the sewers were not provided with any arrangements for flushing. They cleaned and whitewashed 322 houses, many of them lodging-houses, 33 rooms, and 1,322 privies; and flushed and purified 3,436 drains. In addition to this work they issued notices under section 318 of the Calcutta Municipal Act, which led to the limewashing by private individuals of 3,977 dwelling-houses containing 15,867 rooms, 120 stables, 30 coach-houses, 1,576 godowns, 133 cattle-sheds, 437 granaries, 29 bakeries, 16 workshops, 12 warehouses, 49 manufactories, and 2,546 privies. Although, except in four or five places, all old accumulations had been removed, it was stated that, owing to the faulty construction of the buildings, the dirty habits of the people, and the weakness of both the menial and the supervising staff, the refuse accumulated in some of the more crowded wards as fast as it was removed.

Revised building regulations.

More fundamental measures were required than a mere temporary cleansing of the city; it had become urgently necessary to remedy the state of affairs which had caused it to sink into so insanitary and filthy a condition. For some years past the Health Officer of the Municipality had pressed upon the Corporation the necessity of amending the building regulations in order to make suitable provision for

(*inter alia*) fixing the minimum width of public streets, limiting the height of houses in relation to the width of the streets on which they stand, controlling the construction of brick buildings on *bustee* lands, and fixing the minimum size of courtyards within houses, as also the minimum space to be left between the backs of houses for the purposes of ventilation. On the 6th of April the Government of Bengal issued a resolution dwelling on the importance of the subject, and appointing a committee (with the Honourable Mr. Justice Trevelyan as president) to consider the measures that should be adopted. The committee were directed to report the result of their deliberations within six months.

**Reform of the Municipal Administration.**

The Government of Bengal next considered the general revision of the Calcutta Municipal Act. The neglect to maintain the city in a proper sanitary condition was considered to be largely due to the failure of the Municipal Corporation to properly carry out the duties entrusted to them, and this failure was mainly attributed to the Commissioners having, by the formation of large sub-committees and in other ways, assumed in far too great a degree the executive functions properly belonging to the Chairman of the Municipality and his subordinates. It is unnecessary to here trace the series of events which led up to this condition of affairs or to explain in detail the defects discovered in the system. The Government of Bengal being convinced that better administration and more efficient working were not to be looked for without a radical change in system, prepared a draft Bill completely reconstructing the existing Act and defining and largely increasing the powers of the executive. This proposed legislation is at present under consideration. In the draft Bill special attention is paid to sanitation, drainage, and water-supply, and the revised building regulations will be embodied in it.

**Places outside Calcutta.**

Outside Calcutta executive orders were issued during the first period of the epidemic under which the municipalities of the large towns carried out as extensive cleansing operations as their funds would permit.

**Sanitary reform of places near Calcutta.**

After the issue of the revised regulations of November 1897, the Government of Bengal decided that it was necessary to take drastic measures under them for improving the sanitary condition of the municipalities in the neighbourhood of Calcutta, the condition of which was said to be worse than that of the city itself. The Magistrates of the Districts of Howrah, Hooghly, and the 24-Parganas were directed to take the necessary steps to enforce reform by the appointment of Health Officers with a sufficient staff, etc.

In the North-Western Provinces and Oudh strenuous efforts were made to protect the country by improving its sanitary condition. Whitewashing and disinfecting operations were extensively carried out, insanitary privies were put into a wholesome condition, and the Lieutenant-Governor stated that the result of these and other similar measures was to place every city and town in a condition of cleanliness unknown in their previous history.

Cleansing of towns in the North-Western Provinces and Oudh.

## FINANCIAL.

In the chapter describing the measures adopted in the Bombay Presidency the incidence of the cost of plague operations was explained. It will be remembered that the cost of all local remedial, preventive, and sanitary measures fell, in accordance with the financial system of the country, on the funds of local bodies, municipalities, district boards and the like; and that the Government consented to defray from general revenues the cost of the extra establishment and the special accommodation, etc., required for the system of railway inspection. The following orders with regard to the incidence of plague expenditure were issued by the Governments of Madras, Bengal, and the Punjab.

Summary of previous remarks about incidence of expenditure.

Rules made by Local Governments regarding incidence of expenditure.

*Madras.*—The rules for the establishment and maintenance of hospitals and the payment of compensation provide that the cost shall be met by municipalities or district boards as the case may be.

*Bengal.*—The Bengal regulations prescribe that all expenditure not directly paid by private persons shall in the first instance be paid from municipal or district funds, or from loans made under the Local Authorities (Emergency) Loans Act, 1897. Recovery may be made from private persons in cases where they would under similar circumstances be liable to pay under the Municipal or Cantonment Acts.

*The Punjab.*—The rule runs as follows:—

"The Local Government may determine in what cases or classes of cases any charges for the provision of accommodation, diet and treatment for persons detained under these regulations and any sums payable as compensation under them shall be defrayed or paid by any local body: and such local body shall thereupon become liable to defray such charges or pay such compensation accordingly.

"In every case in which any charges are to be defrayed or any compensation is payable under these regulations for which no local body is liable under an order issued under the last preceding clause or under any other law or rule having the force of law, such charges shall be defrayed or compensation shall be paid by the Local Government.

"Provided that nothing in this clause shall be deemed to prevent the Local Government from recovering any moneys thus paid from

any Native State or Railway Administration or Railway Company when such moneys are by agreement or otherwise so recoverable."

## Hardwar and Kankhal.

The Hardwar Municipal Union.

The three small towns of Hardwar, Kankhal and Jawalapur form the Hardwar Municipal Union in the Saharanpur District of the North-Western Provinces.* A short branch of the Bengal and North-Western Railway runs from Laksar Junction (near Roorki) to Hardwar. Hardwar is one of the great pilgrim centres of India; Hindus from all parts of the country flock to the place at certain periods of the year to bathe in the Ganges. The existence of plague at a centre of this nature was a formidable menace to the health of the whole country.

Hardwar outbreak of April to June 1897.

The first outbreak occurred at Hardwar in April and was probably due to infection carried by pilgrims from Sind. The vigorous and well devised measures that were adopted stamped out the disease, after the occurrence of eighteen ascertained cases, by the end of the first week in June. The outbreak at Kankhal began in the middle of September and by the 4th November fifty-one cases had occurred. The disease then quickly abated and the last case occurred on the 10th of November.†

Kankhal outbreak of September to November 1897.

North-Western Provinces Government. Resolutions describing operations at Hardwar and Kankhal.

In a resolution, dated the 22nd July, the Government of the North-Western Provinces and Oudh published a full account of the measures successfully adopted to combat the outbreak at Hardwar, and in a resolution of the 4th November an account was given of the events connected with the Kankhal outbreak up to that date. These two resolutions give a very clear account of the measures enforced and their effect on the course of the disease; they are reproduced in full below.

### HARDWAR.

Religious fairs of April.

"Up to April 1897 no report of the appearance of bubonic plague at Hardwar had reached the Government; but in the month of March 1897 two large and important bathing fairs were held at Hardwar, the first (*Amawas*) on the 2nd April, and the second (*Adha Kumbh*) on the 11th, at which it was expected that pilgrims from plague-infected areas would attend. It is estimated that at the first fair about 40,000 people were present, and at the second about 200,000. Many of those who came to the first fair remained at Hardwar for the second.

Arrangements for dealing with the pilgrims.

"Special arrangements were made for dealing with the large number of pilgrims expected to attend the fairs and for preventing

* See Map, Volume IV, page 14.

† Some other cases have since occurred in the neighbourhood.

if possible, the importation of the bubonic plague by pilgrims coming from plague-infected areas. In addition to the ordinary examination of railway passengers by medical officers appointed for the purpose at Saharanpur and Ghaziabad junctions in accordance with rules made under the Epidemic Diseases Act, every passenger was examined at Pathri railway station close to Hardwar by a staff of hospital assistants helped by vaccinators. Those pilgrims who were found to have come from infected centres were sent on to Hardwar in locked carriages, and were conveyed on arrival to a camp of observation on Rori Island, where suitable arrangements had been made for their accommodation. They were required to sleep and cook their food on the island, but were allowed to go to Hardwar to bathe and buy food, etc. They were examined morning and evening by the hospital assistant in charge, and no disease occurred amongst them.

Sanitary arrangements.

"Pilgrims coming by road were also inspected, and every endeavour made to keep infection out of the town, not only by separation of suspected persons, but also by effective conservancy arrangements. The site of the fair was kept clean by a large staff,* and particular attention was paid to the sanitary condition of the three towns—Hardwar, Jawalapur and Kankhal—comprising the municipality of the Hardwar Union.† Besides the district staff of Magistrates and police, the following medical officers were present :—

* Sanitary police ... 34
Vaccinators ... 30
Sweepers and mates 500
‡ *Chaukidars* ... 130

Medical Staff present.

Surgeon-Major S. J. Thomson, D.PH. (Camb.), Sanitary Commissioner, in charge of the sanitary arrangements.

Surgeon-Captain J. Chaytor-White, Deputy Sanitary Commissioner.

Surgeon-Major J. F. Touhy, Civil Surgeon of Saharanpur, in direct charge of the medical arrangements.

Surgeon-Captain T. F. Kelly, on special duty.

Surgeon-Colonel T. H. Hendley, C.I.E., Officiating Inspector General of Civil Hospitals, also visited the town during the course of the fairs, and Surgeon-Major D. S. Reade, A.M.S., Plague Commissioner, early in May.

Hospital and segregation accommodation.

"In accordance with the general orders issued by Government in connection with prevention of the plague, cottage hospitals or huts had been provided—some for possible plague patients, some for the segregation of relatives and other persons attending plague patients, and others for the observation of doubtful cases. A general hospital had also been constructed on the outskirts of the town for the reception of persons suffering from plague, for whom separate accommodation

† See Map, Volume IV, page 14.

‡ Village policemen.

was not needed. This hospital had separate accommodation for males and females.

**Agency for detecting cases.**

"A reporting agency consisting of sanitary police, vaccinators and *chaukidars*, under the control of an Assistant Superintendent of Vaccination, was established for the patrol of the areas concerned and for the reporting of cases of illness and death. It is believed that these duties were efficiently performed, and reports promptly made. The Sanitary Commissioner reported that there was no cholera and that 'during the whole progress of the two fairs, with this great concourse of people, only about half a dozen fatal cases of disease occurred.' Some of these cases unfortunately consisted of cases of bubonic plague.

**First plague cases.**

"Up to the 11th April, the date of the second fair, two cases of plague had been detected, which were followed by six more in the same month: details of the eight cases are given in the statement attached.* The first case, which was reported by the police on 8th April, led to the inspection of a pilgrim lodging-house, in which a women was found to be recovering from a disease which was probably plague. It is supposed that pilgrims from Sind or other infected quarters must have brought infection to her house, which was specially frequented by Sindi pilgrims prior to the fair. On a thorough examination of the houses in the neighbourhood three more cases were discovered, and three more were subsequently reported—one on the 15th, one on the 18th, and one on the 22nd April.

**Precautions adopted.**

"All these cases, except one, occurred in a *muhalla* or quarter fairly detached from the main body of the Hardwar town. They were dealt with by the sanitary authorities in accordance with the rules issued by this Government on the 26th March 1897 under the Epidemic Diseases Act: and the precautions prescribed in those rules, such as the disinfection of the houses and of personal effects and the segregation of relatives, were duly adopted. As a further precaution, pilgrims leaving Hardwar were examined at the Hardwar railway station and on the roads leading from the town: no cases of plague are known to have occurred in any part of the country traceable to these returning pilgrims.

**Examination of pilgrims.**

**Visit of the Lieutenant-Governor (Sir A. P. MacDonnell).**

"On the occurrence of the last case [No. (8)] it became clear that further measures of a more stringent nature were required. On the 27th April the Lieutenant-Governor discussed these measures with the local authorities and the Sanitary Commissioner at Saharanpur, and before coming to a final conclusion on the subject, visited Hardwar on the 28th, where he met the members of the Municipal

* Not printed.

Board, the *mahants* or priests controlling the temples, and the leading Brahmans of the town. The existence of bubonic plague in the place was not denied, and after full consideration of all representations made the Lieutenant-Governor decided—

(*a*) that the infected area* (*i.e.*, the area in which all the cases but one had occurred) should be placed in quarantine and evacuated, the inhabitants either leaving Hardwar altogether, after examination by, and with the permission of, the Health Officer, or removing to a camp of observation established at some distance from the town in charge of a medical officer: the names and addresses of those leaving to be forwarded to the authorities of the district of destination; Evacuation of infected areas.

(*b*) that after evacuation the houses should be thoroughly cleaned and disinfected, and should not be re-occupied until declared safe; Treatment of houses.

(*c*) that all dead bodies should be examined by a medical officer before burial or cremation (as a further safeguard against concealment of plague); and Examination of corpses.

(*d*) that all pilgrims to Hardwar from infected places should reside in a special camp under medical observation.

"The Lieutenant-Governor acknowledged the good spirit in which his proposals were received after their necessity had been explained to the local gentlemen assembled at the meeting. Pilgrims made to reside in special camps.

"Orders giving effect to this decision † were issued on the 1st May 1897. The evacuation of the infected area was forthwith carried out without difficulty, and steps were at once taken for the systematic cleansing of the *muhalla* in the prescribed manner. All huts and temporary structures were either demolished or burnt (compensation being paid), and the permanent structures and houses disinfected. This may be said to be the close of the first part in the history of the outbreak.

"During May the question presented itself,—whether, in view of the great danger of disseminating plague through India from such a centre of pilgrimage as Hardwar, it was desirable to prohibit the fairs or bathing festivals which were fixed for the 31st May and 10th June. The Lieutenant-Governor was advised by eminent Hindu authority that these fairs might without objection be stopped in view of the danger of the spread of infection by persons visiting Hardwar. But Sir Antony MacDonnell was most unwilling to add to the hardship which the adverse times had imposed on the people, by stopping pilgrimage to their great shrines at Hardwar: he thought it best to make widely Discouraging pilgrimages to Hardwar.

* See Map, Vol. IV, page 15.

† Appendix VII.

known the dangers which pilgrims would incur; to discourage pilgrims from undertaking the journey on this occasion; and to place pilgrims visiting Hardwar, while there, under strict regulations. A notice was accordingly issued in a Government Gazette Extraordinary on 17th May, warning intending pilgrims that it was dangerous to visit Hardwar, and intimating that if they did so, they might be required to live in a camp outside Hardwar under medical observation. At the same time the Government of India, at the instance of this Government, reduced the facilities for travelling by railway to Hardwar.* As it was certain that many pilgrims would visit Hardwar by road, having travelled in many cases for part of the way by rail, an order was issued by this Government under the Epidemic Diseases Act,

**Pilgrim camp.**

requiring all pilgrims arriving at Hardwar, whether from plague-infected centres or not, between the above-mentioned dates, to live in a camp provided for their occupation outside the town. The practical effect of this was to deter from the pilgrimage those who were not bent on making it this year, to close all pilgrim lodging-houses in the town of Hardwar, and to place all arrivals under medical observation, without interfering in any way with religious observances. Arrangements were made for escorting pilgrims from the camp to the shrines and sacred pool at Hardwar for the purpose of bathing, etc., and for bringing them back when the ceremonies were concluded. They were advised to return home as soon as possible. A member of the municipal board or one of the leading *mahants* supervised the details of the arrangements, and rendered valuable assistance; a special hospital assistant was deputed to the Roorkee railway station to examine returning pilgrims and others who might have evaded inspetion by travelling as far as Roorkee by road. It may be noted that not a single case of plague occurred amongst the pilgrims.

**Sanitary arrangements.**

"All this time the utmost care was bestowed on the cleanliness and sanitation of the town, and the limewashing and disinfection of the houses was carried out without intermission. Between the 22nd April and the 16th May no case of plague is reported to have occurred at Hardwar. The caretakers residing in the infected area were free from disease, also the persons who had removed from the infected area to the camp of observation. But on the 16th May a *pujari* or

**Fresh cases of plague.**

attendant at a temple who had visited, and probably slept in, the infected area died of plague (case No. 9 in list attached), and subsequently, at intervals between the 17th May and 8th June, nine cases occurred in a part of the town outside the infected and evacuated area. Details of the cases are given in the list attached.†

* See Home Department Notification No. 1578, dated the 16th May 1897, Appendix VII, page .

† See Map, Vol. IV, page 15.

"The occurrence of these cases stimulated the already strenuous efforts which were being made by the local authorities and the sanitary officers to free the town from infection. Special attention was paid to the registration of mortuary statistics, the examination of every dead body with a view to the prevention of concealment of cases of bubonic plague being specially insisted on. A systematic examination, not only of all houses and buildings, but an inspection of every room, were ordered, the town being divided for the purpose among the officers available for duty. All rubbish was destroyed, old clothes, etc., disinfected, and huts unfit for human habitation demolished. Special attention was paid to the prevention of overcrowding; and the coolies employed near Hardwar on the Hardwar-Dehra Railway works were required to live under supervision in a camp established outside the town for their occupation. *Detection of cases.* *Sanitary arrangements.*

"The operations were carried out under the orders of the following officers:— *Staff.*

Mr. E. F. L. Winter, I.C.S., Collector of Saharanpur.
Mr. E. A. Kendall, I.C.S., Sub-divisional Officer of Roorkee.
Surgeon-Captain J. Claytor-White, Deputy Sanitary Commissioner.
Surgeon-Captain A. W. Dawson, on special duty.
Surgeon-Captain Kelly (temporarily).
Surgeon-Captain Berter (on special duty).

"Orders were issued deputing Mr. E. H. Hankin, Government Bacteriologist, who was recalled from Bombay for the purpose, and Surgeon-Captain Milne (who had had clinical experience of the disease in the Bombay Presidency) to Hardwar for the purpose of assisting the medical officers on duty there in diagnosing doubtful cases of plague. *Bacteriological examination of suspicious cases.*

"It was reported by the Collector on the 2nd June that Hardwar was, in his opinion, cleaner than any other town in India.

"While special attention was thus paid to Hardwar itself, the neighbouring places were not overlooked. At Rikhikesh, 13 miles from Hardwar, a place much frequented by pilgrims, a hospital assistant was posted on duty, and though one man (case No. 14) who died of plague at Hardwar came from Rikhikesh, no trace of the disease could be discovered in that village. The Lieutenant-Governor directed that all villages in the Roorkee subdivision to which Hardwar people might have gone should be specially looked after, and a hospital assistant travelled regularly from village to village near Hardwar for the purpose. *Watching the neighbourhood.*

"As great danger existed of the spread of plague to the adjoining towns of Kankhal and Jawalapur, orders were issued that their sanitary condition should be carefully examined and houses, etc., cleaned and disinfected where necessary. In order to keep a watch upon *Precautionary arrangements in neighbourhood.*

persons residing in these towns who had previously lived in Hardwar or who frequented Hardwar in the course of their daily occupations, a list was prepared of their names and residences. Such persons were inspected from time to time by medical officers, and their clothes and houses disinfected.

**Disinfection of clothes.**

"As no provision existed in the general rules for disinfection of the clothes, etc., of wandering beggars and travellers, many of whom pass through Hardwar, an addition was made for the purpose to rule 32 of the rules of 26th March 1897, and the clothing, etc., of such beggars and travellers were disinfected before they entered the inhabited area.

"The regulation requiring all pilgrims visiting Hardwar to live in a camp remained in force till 12th July 1897, the period having been extended for one month.

**Probable introduction of the disease from Sind.**

"The Plague Commissioner, Surgeon-Major D. S. Reade, A.M.S., considered it 'conclusively proved that the disease was brought to the district by pilgrims from Sind and probably from Karachi:' he thought 'that the outbreak was probably caused by clothes brought from an infected area, the evidence pointing to the person or persons who brought the clothes remaining unaffected.' The evidence that has been collected undoubtedly supports the view that the disease was imported from Sind.

**Location of the plague cases.**

"The first seven cases occurred within 130 yards of one another in a definite portion of the town, the evacuation of which for purposes of disinfection was possible: the remainder* were scattered over an area lying between the Ganges and the upper road from Hardwar to Mayapur, and disinfection was therefore carried out without evacuation.

**Subordinate staff.**

"To assist the officers named in paragraph 10, the following temporary establishments in excess of permanent staff were employed in the Hardwar Union:—

| | |
|---|---|
| Assistant Surgeons ... | 2 |
| Hospital Assistants ... | 3 |
| Female Hospital Assistants | 2 |
| Vaccinators ... | 13 |
| Conservancy Inspector | 1 |
| Sweepers ... ... | 117 |
| † *Bhistis* ... | 6 |
| ‡ *Kahars* and *beldars* ... | 56 |
| Head Constables ... | 8 |
| Constables ... ... | 25 |
| § *Chaukidars* ... | 77 |
| TOTAL | 310 |

* The places at which the cases occurred are shown in the map in Volume IV, page 15.

† Water-carriers. | ‡ Workpeople. | § Village police.

" The employment of female medical officers was considered necessary to allay any prejudice against male practitioners, and to ensure a more thorough examination of houses, the female apartments of which are not open to male medical officers. Female medical officers.

" Efforts were also successfully made to enlist the services of *hakims*, *baids* or independent medical practitioners, and they were given free access to the hospitals, no attempt being made to press upon the patients European in preference to the native or Yunani mode of medical treatment. The main objects steadily held in view were (1) the segregation of the sick and their attendants, (2) the destruction or disinfection of articles likely to convey infection, (3) the disinfection of the houses in which the sick were found, (4) the complete sanitation of the town. Native practitioners. Main objects.

" On the 12th June 1897 the prohibition of the sale of tickets to travel by railway to Hardwar and neighbouring stations ceased to have effect, and from that date pilgrims again began to visit Hardwar. Nearly 300 slept in the special camp on the 13th June, and 248 arrived by train on the 14th June. The police force on duty in the town was augmented by one native inspector, six head constables and twelve constables in order to deal more effectually with this influx, but these police were only employed to keep order. The accommodation at the pilgrims' camp was increased, and the huts made weatherproof in view of the approach of the rainy season. Restrictions against travelling to Hardwar by railway removed.

" About the middle of June an excessive mortality among rats was detected in Kankhal : and on bacteriological examination the plague bacillus was discovered in these rats by Mr. Hankin. The sanitation of Kankhal and the disinfection of the houses had by this time been systematically undertaken, and the mortality among rats ceased without the plague again making its appearance among the inhabitants of the place. The Sanitary Commissioner, who again visited Hardwar to inspect the sanitary arrangements and enquire into the new phase presented by the mortality among the rats, favoured the theory that the rats became infected through infected food—sugar, grain or sweetmeats—which had been removed from Hardwar to Kankhal when plague was prevalent in the former place. Plague among rats at Kankhal.

" The disease among the rats died away, but in order to prevent the transmission of the disease from infected rats to men, the following precautions—which proved successful—were adopted. In the case of any house or godown in which rats were found to be dying in unusual numbers, the house with its contents and the neighbouring drains and premises were thoroughly disinfected in the same manner as if a case of plague had occurred; any grain, sugar and raw food material found in large quantities in such house was exposed to the sun and Precautions with regard to plague among rats.

air for eight hours, being carefully turned over at intervals and then locked up in a specially disinfected room for ten days before being used for food; small quantities of such materials were destroyed; and sacks, baskets, or other receptacles either disinfected or destroyed. The inhabitants of such houses were induced to vacate them for ten days. A reward of two annas per head was at the same time authorised for every rat, living or dead, brought in from Kankhal.

**Last case.**

"By the end of June the whole union of Hardwar had been thoroughly cleansed and disinfected. After the 8th June 1897 (case No. 18) no case of plague was reported from Hardwar, and it became evident that the measures taken had been so successful in stamping out the disease that a relaxation of the precautions was permissible. Accordingly between the 5th and 12th July all the commissioned medical officers (with the exception of the Deputy Sanitary Commissioner, who was directed to remain for a further fortnight) and Mr. Hankin were recalled from Hardwar, an Assistant Surgeon being posted temporarily to the charge of each of the three towns included in the Hardwar Union Municipality; at the same time the conservancy staff was reduced by one-half. The rules in force at Hardwar for the prevention of the spread of the disease were cancelled with effect from the 12th July 1897, with the exception of rule 11, which provided for the location in camp, and medical inspection, of pilgrims coming from infected areas. The inhabitants of all evacuated houses were then permitted to return to them after the houses had been again thoroughly disinfected: the arrangements for the medical inspection of passengers by rail remained in force, but those for the patrol of roads were abolished.

**Removal of staff and gradual relaxation of precautions.**

"Before the Deputy Sanitary Commissioner is withdrawn from Hardwar a careful examination of the whole union will again be made. No date has yet been fixed for the withdrawal of the Assistant Surgeon or the abolition of the reduced special sanitary establishment."

## KANKHAL.

**Danger of spread to Kankhal recognised throughout.**

"The danger of the disease spreading from Hardwar to Kankhal, a town of some 6,000 inhabitants, situated on the right bank of the Ganges and only one mile distant from Hardwar, had never been absent from the minds of the authorities; but during the outbreak of April to June only one case of true plague had occurred in Kankhal, although there were reasons to suspect that rats had largely died in that town. The house in which the case occurred was disinfected at the time and other precautionary measures adopted. These seemed to have been successful; for the disease completely disappeared

**Disappearance of plague amongst rats at Kankhal.**

from Kankhal as from Hardwar, and for several months no case of death from plague was brought to notice either among the inhabitants or rats in Kankhal, although careful watch was kept in the town. The medical authorities, however, think that the disease may have lain dormant during the rains, and that the present outbreak is merely a recrudescence. On the other hand, there appears to have been communication between Bombay and Kankhal during the rains, and it is not impossible that by this means the town may have become reinfected. If the former alternative explanation be the true one, it would seem to the Lieutenant-Governor to inculcate the lesson that in whatever town or village the disease shows itself, there is no assurance of future safety unless the entire town or village is disinfected, house by house.

Cause of the new outbreak of plague at Kankhal.

"In the first week of September 1897 certain rumours reached the Collector and Civil Surgeon of Saharanpur that acute fever, quickly followed by death, had made its appearance in Kankhal. Upon receipt of the information the Collector (Mr. Winter) and the Civil Surgeon (Dr. Elphick) visited Kankhal and made an inquiry into the correctness of the rumours which had reached them, directing their attention more particularly towards the ascertainment of particular facts of the suspicious deaths in question. Their investigation satisfied them that merely deaths from the usual malarial fever prevalent in the locality at that time of the year had occurred. But the attention thus excited was sustained, and on the 16th September the Assistant Surgeon in charge of the Hardwar Union Municipality reported that a suspicious case, supposed to be plague, had been detected in Kankhal, and that the patient had been removed to the plague hospital, which had been kept up from the time of the outbreak in April for the treatment of such cases. The Civil Surgeon went to Kankhal the next day, and having satisfied himself that the case was a genuine case of plague reported it as such to the Government. The Sanitary Commissioner having heard of the case on the day of its occurrence, also proceeded with the District Magistrate to Kankhal, and they were joined there on the 22nd September by the Commissioner of the Meerut Division. All these officers, with a brief necessary absence on the Commissioner's part, remained at Kankhal conducting and supervising the preventive operations until the Lieutenant-Governor's visit to the town on 16th October, when the Sanitary Commissioner left to attend to urgent duty elsewhere.

First unfounded alarm.

Careful watch.

First case.

"From the 16th September (on which date the first ascertained case of plague occurred) up till to-day (4th November) there have been 51 cases, which, though distributed practically over the greater

Total cases.

Foci of disease.

portion of the town of Kankhal, have still been concentrated in groups at certain points. They have been so grouped together as to form certain definite centres or *foci* of the disease, and these groups have been made the basis of the proceedings subsequently taken for the evacuation of infected localities. In dealing with these centres of disease the procedure followed by the sanitary

Measures taken.

and executive officers has been as follows:—The first steps taken were to remove the sick to hospital, to segregate their friends and attendants, to disinfect their clothing, and to completely cleanse and disinfect the houses in which plague cases had occurred. These measures proving ineffectual to stop the disease, it was decided to isolate the whole town and to procure the evacuation of those portions

Isolation.

of the town in which the disease had shown itself or effected a lodgment. Accordingly the town of Kankhal was placed in isolation and surrounded by a *cordon* of guards, with orders to permit no one to enter or leave the town without the permission of the Magistrate. In case of persons wishing to leave, they were required to pass ten days in the observation camp provided for the purpose. These measures were begun on the 23rd September, camps being prepared and the isolation completed within a week. In consequence of the isolation of the town preventing labourers, resident within it, from pursuing their usual occupation outside, it was found necessary to provide a relief work within the *cordon*, which has taken the form of sanitary improvements, clearing jungle, etc. It has also been necessary to establish a charitable fund for relief of beggars, and to provide a temporary dispensary for the use of the sick poor.

Evacuation of infected portions of the town.

"Meanwhile, having selected the portions of the town which, with reference to the cases that had occurred, required to be vacated, the local officers directed their efforts to the expansion or, where they did not already exist from the time of the previous outbreak, to the creation of four classes of camps, *viz.*:—

Camps.

(1) the hospitals (public and private) for the plague-stricken, including huts for the attendants on the sick;

(2) the segregation huts for the use of those persons who, being close neighbours of the plague-stricken, were presumably exposed to the same degree of infection;

(3) a camp for other persons living in the portion of the town or block the evacuation of which had been decided upon;

(4) a camp for persons who wished to leave the town, and who were required before doing so to pass ten days under observation in isolation.

"Some reluctance to comply with the measures detailed above was at first evinced, but this was soon overcome, and the local officers subsequently received much assistance from the people, who recognised that the action was taken for their special benefit and began to thoroughly co-operate with them. Attitude of the people.

"The Lieutenant-Governor, with the Inspector-General of Civil Hospitals, the Sanitary Commissioner, the Commissioner of the Division, the Deputy Sanitary Commissioner, and the local officers, visited Kankhal on the 16th October and inspected the camps, which he found to be admirably suited for the objects contemplated. His Honour found the people to be in excellent temper: he questioned them both in the camps and in the town of Kankhal and heard no complaints whatever. After visiting the various camps, His Honour held a conference of all the officers on the spot, at which the whole situation was reviewed, additional precautions discussed, and orders issued on necessary points. His Honour also discussed the situation with the chief local residents and was able on certain points to comply with their wishes. The Lieutenant-Governor was informed by the medical officers that the general health of the people had improved since they went into the camps, where suitable arrangements are made for their convenience, for the privacy of the female members of their families, and where special attention is paid to their sanitary condition. At the time of His Honour's visit there were nine camps, established in the vicinity of the town, falling under the classification above noted and containing a population of about 1,200. Since then the number has largely increased, and information has just been received by the Government that the whole town has been evacuated and the entire population accommodated in the camps. Visit of the Lieutenant-Governor.

"Of the character of the disease there can be no doubt whatever, as in numerous cases referred to the Bacteriologist to Government (Mr. E. H. Hankin) the specimens sent were reported to be "typical plague." Apart from this, the Sanitary Commissioner, Deputy Sanitary Commissioner and Civil Surgeon had no hesitation whatever in diagnosing the disease as true plague. Out of 51 cases 38 have proved fatal, the symptoms being those of true plague; thirteen cases with similar symptoms remain under treatment in hospital. No doubt that the disease was plague.

"In regard to the general organisation for dealing with the outbreak, no improvement had to be suggested by the Lieutenant-Governor at his visit in the general system or scope of the arrangements, which followed those which had proved successful last summer. But it was considered prudent to extend the disinfecting operations to the towns of Hardwar and Jwalapur (in which the disease has not appeared). Moreover, the subordinate establishment and the officers Disinfection. Increase in the

subordinate establishment.

on the spot were found to be overworked, and it was deemed necessary to strengthen the staff. One Tahsildar and three Naib Tahsildars have been especially deputed for work in the town, and selected patwaris are called in to assist in carrying out the operations. It was directed that Mr. Kendall, the Assistant Magistrate in charge of the Roorkee Subdivision, should be temporarily relieved of the work of the Subdivisional Officer, and should be placed on special duty at Kankhal, another officer being sent in his place to Roorkee. In the absence of the Sanitary Commissioner, the Deputy Sanitary Commissioner was placed in control of the medical or sanitary operations, and another Commissioned Medical Officer was deputed temporarily to Kankhal. This gives three Commissioned Medical Officers for the Hardwar Union Municipality. At the time of the Lieutenant-Governor's visit the following subordinate medical staff was employed :—

| | Assistant Surgeons. | Hospital Assistants. | Compounders. | Female Assistants (dâis). | Vaccinators. |
|---|---|---|---|---|---|
| Kankhal ... ... | 2 | 10 | 2 | 3 | 2 |
| Jwalapur ... ... | 1 | 2 | ... | 1 | 3 |
| Hardawar ... ... | 1 | 1 | 1 | ... | 5 |
| TOTAL ... | 4 | 13 | 3 | 4 | 10 |

"This staff was considered to be sufficient at that time, but in view of the possible extension or appearance of new *foci* of the disease, and the great necessity of having on the spot sufficient expert staff to deal with such possible increase of sickness, the Lieutenant-Governor decided to make immediate arrangements for doubling the disinfection gangs, and to this end ten more hospital assistants and one additional Assistant Surgeon were deputed to Kankhal.

Disinfecting gangs.

"Coming to the executive subordinate staff, ten gangs were at the date of the Lieutenant-Governor's visit employed on disinfection work in Kankhal, each gang being composed of 16 men (kahars, beldars, bhishtis and sweepers) in charge of a medical subordinate (hospital assistant or compounder). These gangs were employed on the evacuated blocks of buildings in the infected areas. They commenced work at the house in which the case of plague occurred, taking the neighbours' houses next in hand and gradually enlarging the circle. They first remove all property from the house in the presence of the owner; they then proceed to burn all worn-out mats, chappars, rags and destructible articles of little value after such things have been

valued by a committee of native gentlemen. Compensation is given in case of hardship. The house is then thoroughly cleaned and disinfected: the walls, floors and roofs being washed with a solution of perchloride of mercury (1 in 1,000). Furniture and articles of value are taken out in the sun and treated in the same way. This procedure is followed systematically from house to house in the infected block, and in due course the disinfection operations will be extended to every house in the town. The increased establishment will permit of this disinfecting process being speedily extended to blocks in which the disease has not yet appeared, and thus have, it is hoped, a salutary preventive effect. Power is left to the local officers to increase these gangs still more should circumstances call for this.

Grain stores.

"In the town of Kankhal large quantities of grain are kept: and it was a matter of great importance to prevent these stores from becoming infected through plague-stricken rats. It was settled that such stores of grain should be thoroughly aired in the sun and the godown or store-rooms well disinfected before the grain was again replaced in them. It was considered unnecessary to issue any orders for the destruction of grain.

Guard.

"The work of guarding the town of Kankhal and of preventing ingress and egress was being done by a force of police and chaukidars, including 92 chaukidars who had been withdrawn from villages in the neighbourhood, substitutes being temporarily employed in their place. In the same way many of the police officers had been withdrawn from police stations in other parts of the district: as the services of these men could no longer be utilized, the Lieutenant-Governor decided to make up the force employed at Kankhal to 15 mounted constables and 100 constables with the necessary complement of head constables.

"It was also arranged that the repairs to the head works of the Ganges Canal should be hastened to completion and water sent down the canal, whereby the isolation of the town, both as regards men and monkeys, would be greatly helped.

"No special disinfecting or conservancy staff was employed at the neighbouring towns of Hardwar and Jawalapur. The Collector was accordingly requested, as a precautionary measure, to cause the conservancy staff of those towns to be strengthened so far as in conference with the Deputy Sanitary Commissioner and medical officers on the spot, he might consider expedient, reporting his action for the information of Government.

Plague amongst monkeys.

"About the time of the Lieutenant-Governor's visit to Kankhal the possibility of the monkeys (which swarm in the town and frequent the houses) being attacked by the disease like the rats was

attracting the attention of the authorities. Up to that time the mortality among monkeys was not specially noticeable, and in two specimens taken from dead monkeys and sent to Mr. Hankin for bacteriological examination the plague bacillus was not discovered. Since then, however, monkeys have died in Kankhal in larger, though still in moderate, numbers, and in several specimens taken from their dead bodies, Mr. Hankin has discovered the typical plague microbe. The matter had therefore assumed a very serious aspect, for if plague-stricken rats convey and propagate the infection, so probably do plague-stricken monkeys. At all events it would not be safe to act on any other supposition, while this supposition invests with risk any expedient, such as deporting the monkeys to distant jungles or other method of dealing with them, short of destroying them or trapping and keeping them in confinement. The destruction of the monkeys is not to be thought of, for this among other reasons, that they are regarded with a feeling akin to religious reverence by the people; while the alternative of trapping and confining many thousands of these creatures is an undertaking of great magnitude. However, the difficulty had to be faced: it was only by facing it and making a beginning that a way out of it was to be found. Accordingly gangs of *Kanjars*, who are expert at trapping monkeys, are now at work in Kankhal catching monkeys, especially those presenting any appearance of illness, and keeping them under observation in cages in isolated places. The latest reports go to show that the mortality among the monkeys is not increasing, and that no plague-stricken monkey had been detected for over a week. A search recently made through the evacuated quarters did not result in the discovery of any dead bodies. No doubt the thorough disinfection of the whole town will have its natural salutary effect in reducing the danger of infection, whether among human beings, or monkeys, or rats. The Deputy Sanitary Commissioner reported on the 1st instant that over half of the town had been disinfected; and he hoped to have all the houses, etc., disinfected by the 21st instant.

**Pilgrimage.**

"On the 25th October the Somvâti Amâvas fair was held at Hardwar, and the 9th November is the date fixed for the Kartik Puranmashi. As it was to the general interests to discourage the influx of people to Hardwar at a time when plague was prevalent at Kankhal, the necessity of temporarily suspending booking to Hardwar and neighbouring stations was represented to the Government of India, who have accordingly directed that, with certain exceptions, no tickets to travel by railway to Roorkee, Landhaura, Lhaksar, Pathri, Jawalapur, and Hardwar shall be sold between the 23rd day of October and the 16th day of November. About 300 pilgrims only attended

**Temporary stoppage of railway booking.**

the fair on the 25th October, and effective measures have been taken to prevent any communication of the visitors with Kankhal.

"The latest reports which have reached the Government from Kankhal are encouraging, and there is reason to hope that the vigorous measures of the authorities, coupled with the exertions of the people themselves, will, under Providence, get the better of the disease. The type of disease is said to be growing less virulent, and no seizure has been reported since the 1st instant." Decline of the epidemic.

## Khandraoni.

### PRELIMINARY REMARKS.

The lesson to be derived from the operations carried out at Khandraoni is no less important than that furnished by the events which occurred at Hardwar. At Hardwar measures of segregation, evacuation and disinfection were successful in stamping out isolated cases before they had grown into a serious epidemic. At Khandraoni similar measures carried out on a small scale in a very thorough manner were successful in arresting almost immediately an epidemic which had become virulent in the confined area of a small village. In a previous chapter an account has been given of the beginning of the epidemic. When the existence of the outbreak was ascertained there had been 59 seizures and 47 deaths in a village of about 550 inhabitants. Intimation of the outbreak was first received by the Magistrate of Jhansi (which is only twenty-one miles distant from Khandraoni) and telegraphed to the Government of India by the Government of the North-Western Provinces and Oudh on the 15th March. The Government of India telegraphed the news to the Agent to the Governor General in Central India and His Highness the Maharajah Sindhia (in whose territories the village of Khandraoni is situated) immediately despatched Surgeon-Lieutenant-Colonel Crofts, the Medical Officer to His Highness, to the spot with instructions to see to the care of the sick and to stamp out the epidemic and prevent its spread. He arrived on the 18th March and the subsequent arrangements were carried out under his orders and personal supervision. Dr. Crofts had no doubt from the first that the disease was plague and without delay instituted and carried out stringent and radical measures.

Lessons to be derived.

Position at the time the epidemic was discovered.

Arrival of Dr. Crofts.

### EVACUATION OF THE VILLAGE.

An order was sent to the officer commanding the Karera cantonment to march at once to Khandraoni with four companies of infantry and hospital establishment and equipment. The executive officer in

charge of the Karera subdivision (in which Khandraoni is situated) was also ordered to come to the village and arrange for supplies for the troops and villagers. In the meantime a nominal roll was made of all the inhabitants of the village, and it was found that the total number present was 435. These were examined and were divided for the purpose of segregation into the following four classes :—

Classification of villagers.

*Class I.*—Those families who were perfectly healthy and amongst whom no case of plague or fever of any kind had occurred since the 9th of January (it was thought advisable to treat any case of fever as coming under the head of plague as it was impossible, from questioning the villagers themselves, to distinguish, with any certainty, between so-called fever and plague).

*Class II.*—Those families who were in good health, but amongst whom cases of plague and fever had occurred since 9th of January.

*Class III.*—Those families amongst whom there were cases convalescent from plague or fever.

*Class IV.*—Those families some of whose members were then suffering with plague or fever.

Method of evacuation.

On the 14th March the military arrived and the inhabitants were ordered to go to their houses and remain there. Sentries were then posted on all the infected houses (*i.e.*, of classes II, III and IV) as well as on those of class I in their immediate vicinity, and strict orders were issued to prevent any persons entering or leaving those houses or taking any article from them. The remainder of the inhabitants were then turned out of the village and surrounded by a cordon of sentries. They were allowed to take with them any property which they wanted. Classes II, III and IV as well as those of class I living in their immediate vicinity were then taken successively out of the village and segregated one from another by a cordon of sentries, those of class I hitherto detained being allowed to join the others of the same class.

Classes II, III and IV and the members of class I who were detained with them were not allowed to take anything out of their houses except the clothes they were wearing, as much bedding as was absolutely necessary, and their money, ornaments and cooking utensils. The village having been evacuated, sentries were posted all round with strict orders to prevent any one from entering it.

## ARRANGEMENTS IN THE HOSPITAL AND SEGREGATION CAMPS.

Hospital camp.

At the time of Dr. Crofts' arrival there were eleven persons ill of plague. They were isolated in a camp hospital which was

placed under the immediate medical charge of the hospital assistant, who had arrived with medicines with the troops. A temporary hut was provided for each patient, the huts being placed about twenty yards apart. Similar huts were provided for the members of the patient's family who were allowed to attend upon their own sick, but were discouraged from coming in any number to the huts of the patients. Bedding was also supplied, and suitable food was cooked for all patients either by a member of the family or by a Brahman who was appointed cook. A sweeper was entertained for the hospital camp and was not allowed to go outside until it was finally broken up. When a patient died his clothing, bed and bedding and hut were burnt, compensation for the clothes being paid to the relatives.

Food-supply.

The following arrangements were made for feeding the villagers:—

"(*a*) Two retail dealers were engaged from a neighbouring village, where it was ascertained that no plague was present, and the necessary supplies were also brought from the same source.

"(*b*) Both retail dealers and supplies were placed under a guard, orders being given not to allow any of the villagers to come in contact with them, nor to allow the latter to mix with the inhabitants of the village.

"(*c*) The amount of grain, etc., necessary for each individual family was calculated and supplied once a day under the following arrangements.

"(*d*) The daily supplies were taken by a bunniah under escort to the boundary of the segregation camp, where one member of each family was deputed to receive them. The supplies were then weighed and handed over, care being taken that neither the bunniah nor his scales came in contact with the segregated inhabitants; the bunniah was then marched back to the place allotted for supplies and again placed under the Commissariat guard."

Little or no grain was bought from the village by class I villagers as the previous year's store was exhausted.

Arrangements in camp.

Arrangements were also made for the provision of temporary huts, and straw and blankets for the old and weakly. The segregation camps were all situated on the banks of a small river, so that the water-supply presented no difficulty, but care was taken that the segregation camp of the healthy portion of the inhabitants was highest up stream, while the hospital camp was lowest.

Roll call.

Every morning and evening a bugler blew "the assembly" for roll call and inspection in the several camps, and any one showing signs of disease or debility was put apart for further examination.

**Arrangements for the support and comfort of the inhabitants.**

Those among the inhabitants who earned their livelihood by daily labour or begging were unable to pursue their ordinary avocations and were therefore put on free rations at the expense of the State. Every effort was made to convince the people that the measures taken were for their own benefit, and to stop the mortality amongst them. Compensation was promised for the unavoidable damage to their property and crops, and they were made as comfortable as was possible under the circumstances. Small luxuries, such as tobacco, were given to them; they were urged and encouraged to scatter themselves as much as possible; to wash themselves; and their clothing and to keep the ground in their vicinity clean. At the same time they were given clearly to understand that the camp rules would, if necessary, be carried out by force.

**Harvest.**

At the time of the segregation the crops were ready for the harvest. To enable the villagers to harvest them a few more companies of infantry were sent for, and on their arrival the line of sentries round the segregation camp was thrown back to the village boundary. The villagers belonging to class I were then allowed to harvest their crops at leisure, and, after ten days in segregation camp without the occurrence of any case of plague among them, the villagers belonging to class II were given the same permission. The crops of classes III and IV were harvested under the direction of a subordinate revenue officer of the State.

## ARRANGEMENTS FOR GUARDING THE CAMPS.

**Strangers not allowed to enter the village.**

Nobody except the segregated villagers, the medical staff, and the officers and sepoys engaged on segregation duty, was allowed to remain within the limits of the village.

**Guard.**

The sentries were prohibited from entering the segregation camps and were warned not to let any of the villagers approach within fifteen yards of their post. No person, whatever his rank, business or occupation, was permitted to enter or leave the segregation camps or cross the village boundary without an order from Dr. Crofts, and without being accompanied by one of the orderly havildars detailed for this duty, and orders were issued to the sentries that under no pretext whatsoever was this rule to be broken. To make obedience to the rule more certain, entrance to or exit from the village boundary limits or segregation camps was absolutely prohibited except at one place appointed for this purpose. Dr. Crofts states that considerable inconvenience no doubt arose from this rule, but it was early recognised that its strict observance was of the most vital importance. Only one instance came to light in which the rule was evaded.

Supplies for the sepoys were brought from outside into their camp (which was pitched about a mile from the village) under escort. The carts were unloaded and the carts and cartmen were at once conducted outside the village limits. Similar precautions were observed in the case of the supplies brought to the retail dealers for the use of the village. Supplies.

## CLEANSING AND DISINFECTION OF THE VILLAGE.

At the time of the evacuation of the village, hay and other inflammable materials were placed in the infected houses and those in their immediate vicinity and they were then set alight and destroyed, care being taken that nothing that could be burnt escaped. Burning infected huts.

The cleaning and disinfection of the village was delayed until the place had been exposed to the disinfecting action of the sun and air for three weeks, with a view to remove any danger of the persons engaged in the operation contracting the disease.

Dr. Crofts gives the following account of the way in which the cleansing and disinfection were carried out:— Method of cleansing and disinfecting.

"A number was affixed to every house in the village and a list of the owners was made. The houses being divided into classes to correspond with those into which the inhabitants had been divided in the first instance, except that class II was amalgamated with class I.

"The owners of class I were then required to clean their own houses and, for this purpose, were divided into working parties of not more than ten persons in each, each working party being supplied with *phowras*,* baskets, etc., to clean away dirt and rubbish, and lime for the purpose of whitewashing the houses inside and outside, and were placed in charge of two sepoys who were ordered to see that this work was thoroughly and quickly carried out, and that all rubbish was removed to a distance and burnt as far as possible, that the working parties did not enter houses other than their own, and that every evening they marched them outside the chain of sentries posted round the village and saw that the *phowras*, baskets, etc., were deposited in the place assigned to them under a guard. Rest from noon to 2 o'clock was allowed, and the work was daily inspected in order to see that it was properly done. Class I.

"As the people of classes III and IV were still segregated from the rest of the population and remained so until the camp was finally broken up, working parties were engaged to clean their houses from which the *debris* was first removed; the floors were then dug up to the depth of one-and-half feet, the walls were scraped, and both were Classes III and IV.

* A form of spade.

thoroughly spread with disinfectants by means of a fire-engine, worked by hand, brought from Gwalior for this purpose.

"In the meantime the working parties were engaged in cleaning up the village generally, every one employed being paid daily, and the working parties being all under the supervision of sepoys told off for this purpose; no slouching was allowed, and the work was carried out systematically and continuously until I was satisfied that the village was cleaned as far as any Indian village could be."

## MEASURES TO PREVENT THE SPREAD OF INFECTION TO SURROUNDING VILLAGES.

The following measures were adopted to prevent the spread of the epidemic to the surrounding neighbourhood:—

**Daily reports from neighbouring villages.**

"(1) A list containing the names of every village within a radius of ten miles from Khandraoni was made out. These villages were divided into circles of four or five villages, each according to the distance between them, and each circle was placed in charge of a policeman, whose duty it was to collect daily reports from the officers of each village. The reports contained the following information:—

(*a*) whether there were any sick in the village, and if so, the nature of the sickness;

(*b*) whether any one had arrived or left the village since last report, and if so, where they had come from or gone to.

**Return of emigrants from Khandraoni.**

"(2) On comparing the census of Khandraoni, taken in July 1896, with the number of people present when the roll was made out, it was seen that there was a considerable decrease in the population, even allowing for the number who had died of plague and other cause during the preceding eight months. A return was therefore called for from all villages within ten miles radius showing if any one from Khandraoni had arrived in the village since the beginning of January, and if so, whether they were still there, a list of their names with dates of arrival being also asked for: enquiry was also made from the inhabitants of Khandraoni itself as to the whereabouts of any one who had left the village since the arrival of the Brahmins who brought the infection from Bombay.

**Arrivals from Bombay.**

"(3) Orders were issued that if there were any persons who had come from Bombay since July 1896, or from Khandraoni since the 1st of January 1897, such persons were to be

segregated outside the village until inspected by the medical officer.

"(4) A list was called for giving the names of any of the inhabitants of villages who might then be in Bombay, and orders were issued that their relations in the village should write and tell them that they were prohibited from coming back to the State during the continuance of the plague at Bombay. Absentees in Bombay.

"(5) Orders were issued to the inhabitants of all villages within ten miles round that no person from Khandraoni or Bombay was to be admitted into the village; moreover, they themselves were prohibited from coming to Khandraoni, and they were also told that, except for any very urgent reasons, they were to remain at their own village for at least a month. Directions to villagers of the neighbourhood.

"(6) The villages all round were inspected, those in which there were people who had come from Khandraoni and Bombay being taken first, and no case of plague was found to be present amongst them. False alarms were at first of frequent occurrence, as the daily reports contained many cases, whose symptoms, roughly described by the village officers, might be those of plague; these were inspected without delay, and none of them were proved to be plague." Inspection of neighbouring villages.

## EXTINCTION OF THE EPIDEMIC.

The measures thus carefully devised and carried out were completely successful in achieving their object, and in a very short time the epidemic was extinct. On the day Dr. Crofts arrived there were eleven persons ill of plague. After that date there were only four admissions to hospital, all of which occurred within ten days of the formation of the segregation camps. Only four admissions to hospital camp after the start.

It is worthy of note that of the fifteen cases treated in the hospital only five died, whilst the mortality before Dr. Crofts' arrival was 80 per cent. of the seizures. Mortality.

## RETURN TO THE VILLAGE.

The village having been thoroughly cleansed and disinfected, no case of plague having occurred since the 1st April, and no death since the 11th, and the patients under treatment having recovered, the segregration camps were broken up on the 29th of the month. Before this was done every man, woman and child in the hospital camp was obliged to bathe and exchange the clothes he or she was wearing for new ones, which were supplied free. The hospital huts, patients' clothes, blankets, beds, and all other articles of a combustible nature Breaking up of camps.

Precautions on breaking up hospital camp.

were burnt, and the only things brought out of the hospital camp were money, jewellery, metal cooking utensils, and the new clothes given to the occupants.

Arrangements were made for a hospital assistant with medicines to remain at the village for one month, and he was directed to hold periodical inspections and to report the result. The harvest having been gathered, and there being many in the village who gained their livelihood by daily labour or begging, relief works were started for the former and free rations were continued to those of the former who were unable to work. A careful estimate was made of the loss sustained by the villagers by damage to the crops and the destruction of houses and property and the amount of that loss was paid to them by the State.

**Compensation.**

# CHAPTER X.

## MEASURES TO PREVENT THE SPREAD OF INFECTION BY LAND.

### Discussion of principles—Land Quarantine and the stoppage of Railway Traffic.

Discussion of principles.

The early efforts made to prevent the spread of plague infection by persons travelling by land are described in succeeding sections of this chapter. The whole subject of the principles governing these efforts came under careful discussion in February and March 1897, in connection with proposals to impose quarantine against the Bombay Presidency or to prohibit third class railway traffic from stations within the Presidency.

Proposals for land quarantine and the stoppage of third class railway traffic.

On the 13th February the special Calcutta Medical Board urged that all persons leaving Bombay, Karachi or other infected places should be detained for ten days under observation. The Government of Bombay then suggested the expediency of imposing quarantine against the Bombay Presidency, posts being established on the border at suitable places, generally a long distance on the Bombay side of the frontier. It was also suggested by the Government of Bombay that third class railway passenger traffic might be temporarily suspended along certain sections of the line of communication. On the 4th March the Lieutenant-Governor of the Punjab proposed that, plague having broken out in Sukkur, an endeavour should be made to check the advance of the disease into the Punjab by the imposition of ten days' quarantine at some place within the southern portion of the province, cordons being thrown out at right angles to the railway and river extending some distance west into the Dehra Ghazi Khan district and east into the Bahawalpur State. On the 16th March the Agent to the Governor General in Rajputana telegraphed a proposal that, plague having become endemic in the native state of Palanpur near the Rajputana border, people from Palanpur should be prevented from travelling northwards by rail.

Objections to land quarantine.

The Government of India having carefully considered these proposals, and having taken the opinion of their sanitary adviser, decided that there were insuperable objections both to the imposition of land quarantine and to the prohibition of third class railway traffic from infected districts. In arriving at these conclusions, the Governor General in Council was mainly influenced by the following considerations.

Previous experience in India.

All experience in India, including that of an attempt that had recently been made by the Commissioner in Sind to impose quarantine at Sukkur, showed that the imposition of absolute land quarantine was ineffectual. In a previous chapter the failure to protect the Ahmedabad district by quarantine during the 1812 to 1821 epidemic has been noticed, and also Dr. Ranken's condemnation against the strict land quarantine imposed during the Pali outbreak of 1836 and the failure of that quarantine to protect the route through Merwara. In 1876 a committee was appointed in the Punjab to consider the question of land quarantine against cholera, and reported that strict land quarantine was impossible in India.

Statement of objections.

The Government of India were convinced that an endeavour to quarantine the Bombay Presidency, a large portion of which was infected when the discussion took place, would be no more efficacious than previous efforts of a like nature. No extensive cordon in India can be expected to be proof against attempts to evade it, and an endeavour to establish a cordon along the great length of the Bombay frontier could not possibly succeed. Besides being ineffectual the attempt would be likely to lead to mischievous results. In the first place, it would distract attention from the important measures of observation and sanitary improvement. In the second place, it would occasion an unjustifiable amount of hardship and suffering, and it would give opportunities for oppression and extortion. In the third place the aggregation of large bodies of people on the borders of the infected area under circumstances rendering proper sanitary administration very difficult or even impossible presents conditions very favourable to the spread of disease and may occasion serious epidemic outbreaks. The imposition of land quarantine is also contrary to the accepted principles for the treatment of epidemic disease. The Dresden Sanitary Conference of 1893 was opposed to land quarantine; and declared (Chapter V, Annexure I) that only persons suffering from cholera or presenting cholera-like symptoms should be detained. That conference was composed of the delegates of a number of European states possessing national frontiers, customs lines, and national and trade interests, all tending to facilitate quarantine regulations, and it declared against land quarantine under circumstances far more favourable to its adoption than those which exist in India. The delegates of Her Majesty's Government at the Sanitary Conference held at Venice in February and March 1897 to devise measures to prevent the spread of plague were instructed to urge the acceptance of the principles of the Dresden Convention, and in the convention framed by that conference those principles were re-affirmed. In chapter I, section III of the regulations prescribed by the Venice Convention, it is stated that modern methods of disinfection should be substituted

Dresden and Venice Conventions on the subject of land quarantine.

for land quarantine; and in chapter II, section V, the rule is laid down that land quarantine should no longer be enforced, and that only persons presenting symptoms of plague should be detained. After prescribing these principles the conference made the concession, in order to cover the difficulties which were likely to be experienced by certain Governments in preventing the importation of plague into their countries by land routes, that during the prevalence of plague every country had the right to close its land frontiers either in part or in whole against all traffic.

Objection to the stoppage of third class railway traffic.

The Government of India also considered that the suggestion to stop third class railway traffic from infected districts could not be adopted. The precaution could be evaded by breaking the railway by a road journey across the frontier. It would make invidious distinctions between classes and would cause great inconvenience and hardship. It would also be ineffective, inasmuch as it would offer no check to the spread of the disease otherwise than by railway, and would not prevent the chance of infection being carried by persons choosing to take first or second class tickets. It would also greatly increase the chance of infection being carried by other means than the railway. Prevented from travelling by rail the inhabitants would scatter over the country-side, and find an egress by ways which would render inspection and control difficult or impossible. The stoppage of third class railway traffic is, equally with the imposition of absolute land quarantine, opposed to the principles of the Dresden Convention of 1893 and the Venice Convention of 1897.

Alternative precautions prescribed by the Government of India.

Guided by these considerations, the Government of India negatived the proposals for the imposition of land quarantine and the partial stoppage of railway traffic, and in the place of these measures prescribed the precautions detailed in the succeeding portions of this chapter. They stated that all travellers from infected districts should be inspected by a medical officer, and that any persons deemed likely to carry infection should be detained under observation in suitable segregation shelter and under proper sanitary supervision until the danger of their spreading infection was past. In determining whether travellers should be detained or not, inspecting officers were directed to exercise the widest discretion, and they were instructed that any person who was at all suspicious either by reason of his appearance, symptoms or the dirty condition of his clothes or effects should not be permitted to proceed without being placed under observation. It was also prescribed that the class of persons, who when they enter a town can neither be traced nor depended on to give information of plague, should be treated as suspicious. Similar instructions were given with regard to persons, such as labourers and emigrants, who travel in bodies. With these precautions were

combined measures for the disinfection of the personal effects of travellers likely to carry infection, for the supervision at their destination of travellers from infected districts, and generally for the detection of plague cases on their occurring in any town or village in the threatened provinces. The Government of India hoped that these measures would protect the rest of India against the Bombay Presidency with the least possible amount of interference with intercourse and without avoidable hardship. The established fact that isolated cases of plague are not difficult to stamp out if they are at once detected and due precautions taken, lent additional force to this expectation, which was on the whole justified by the result.

**Proposals of the Government of Bombay for the enforcement of local land quarantine.**

In a telegram, dated the 17th March, the Government of Bombay, whilst accepting the decision of the Government of India against the proposal to impose general quarantine against the Bombay Presidency, urged that land quarantine should be permitted at selected places within the Presidency. They gave the following reasons.

In accordance with the custom of the country in dealing with cholera, the inhabitants of healthy villages in the Thana and Surat districts had already imposed quarantine against villages infected with plague. In some towns and villages specially liable to infection limited quarantine had been imposed with good results by District Magistrates and Political Agents. Quarantine even if not thoroughly effective checks large movements of people, and persons flying from an area, where active remedial and disinfecting operations are anticipated, avoid going to a town where quarantine has been imposed. Quarantine need not be absolute, but it is specially important to apply it to the class of people, who when they enter a town can neither be traced nor depended on to give information of plague among them. Medical inspection, though valuable, does not detect cases that are only incubating, and the experience of the city of Bombay had shown that cleansing operations cannot check plague, unless accompanied by measures for the detection of all new cases—a procedure requiring a larger staff than can be supplied in most country towns. With regard to the stoppage of third class railway traffic, the Government of Bombay stated that it would not be carried out except in particular cases and for most cogent reasons. The Government of India recognised that the villagers in threatened districts might and should be allowed to protect themselves by voluntary action, and that it was desirable to treat as suspicious persons who on entering a town can neither be traced nor depended upon to give information of plague among them. They were, however, entirely averse from the imposition of compulsory quarantine between different

local areas. They accordingly replied in a letter, dated the 29th March, that the general objections against land quarantine, which they considered to be overwhelming, hold good in the case of the imposition of quarantine by one local area against another local area. Such quarantine, it was remarked, besides being opposed to the principles which have been repeatedly affirmed by those who have most studied the subject, is sure to be ineffectual and to give rise to hardship and oppression, and may very possibly foster outbreaks of the disease. The only circumstances under which strict compulsory quarantine is possible and likely to be effectual is when the outbreak occurs in a small place, the inhabitants of which can be easily and securely isolated away from the area of infection, and then the isolation must be most carefully regulated and controlled and proper sanitary precautions must be taken. The operations at Khandraoni in the Gwalior State, described in Chapter IX, were instanced as an example of the successful imposition of strict segregation on a small scale. Here the circumstances were exceptionally favourable, inasmuch as the village is small, it was found easy to isolate the inhabitants outside the area of infection, and a commissioned medical officer of experience was deputed to the spot, and the adoption of all possible sanitary precautions and the prevention of oppression and extortion thus secured. The larger the place and the less complete its isolation, the greater become the difficulties, and the point is very soon reached when they are insurmountable.

**Objections to local land quarantine.**

The revised general rules for the control of remedial and preventive measures in the Bombay Presidency, issued by the Government of Bombay on the 29th March, contained the following two rules authorising the imposition of local land quarantine :—

**Modification of the general rules issued by the Government of Bombay on the subject of land quarantine.**

"*Rule 26.*—District Magistrates are empowered, when they consider it necessary, to impose quarantine at any place or places against any other place or places."

"*Rule 29.*—A District Magistrate, with the sanction of the Commissioner, is empowered to prohibit inter-communication between any place and any other places."

At the request of the Government of India the Government of Bombay cancelled these rules and substituted the following rule in accordance with the prescribed principles :—

"*Rule 29.*—Plague authorities specially appointed by a Commissioner for this purpose are authorised to prevent the passage of suspicious persons from any town, village or local area, or into any town, village or local area to which this rule may be applied by the Commissioner, unless such persons have been detained in a place of observation for a period prescribed by the Commissioner : and unless, if arrangements for disinfection of their clothing, baggage, etc., have

been made under the Commissioner's orders, such disinfection has been effected. Such plague authorities shall have the widest discretionary power, subject to the general or special orders of the Commissioner, to decide what person shall be considered 'suspicious' for the purposes of this rule. So long as he remains in a place of observation under this rule, no person shall be allowed to communicate, except with the permission of the plague authority, with persons outside the limits of the place. He shall obey such orders as may be issued by the plague authority for the cleanliness or protection from infection of the persons, property or quarters of the persons detained."

Rules to control egress from infected localities issued by the Government of Bombay in October 1897.

At the time of the recrudescence the Government of Bombay appointed a committee of experienced officers to devise, if possible, further means of preventing people from leaving infected localities and entering other places until suitable precautions have been taken with respect to them. The outcome was the issue by the Government of Bombay, on the 5th October 1897, of a set of rules to control the egress of persons from infected localities. A copy of these regulations is given in Appendix VIII. Broadly, the rules are intended to prohibit persons from travelling from infected localities to other places without a pass granted by the plague authority appointed for the purpose, and they provide that if it is considered necessary, the pass shall not be granted until the person has been disinfected and detained under observation in an observation camp. The rules further explain generally the circumstances under which passes may be granted without previous detention, and permit certain classes of persons to travel without passes. With regard to the particular case of railway traffic the rules prohibit booking within fifteen (increased by a later notification to twenty) miles of the infected locality in the case of persons who have not (*a*) a pass, if they come from the infected locality, or (*b*) a certificate from the village officer that they have been residing in the village and have just left it, if they come from a locality outside the infected area.

Remarks of the Government of India.

After a careful consideration of these rules, the Government of India were constrained to point out that their general tenor was such as to give an indirect encouragement to land quarantine, and that the plague authorities charged with working them might easily, unless their action were carefully supervised, utilise them for the imposition of such quarantine. Allusion was again made to the grave objections which had from the outset been taken to the imposition of land quarantine, and it was observed that this view had been endorsed by the recent Sanitary Conference at Venice, and must be strictly followed by the authorities in India.

The form of the rules was also considered open to objection inasmuch as it exempts from their operation certain classes of persons such, for instance, as Europeans and Government and railway servants, and, with the sanction of the District Magistrate, their families and attendants. The Government of India stated that they were totally opposed to any interference with the ordinary avocations of persons who are not sick or suspicious, but in their opinion it is wrong to exempt special classes of persons from the operation of the rules. The principle which should govern the rules is that they should apply to all classes, but that detention should be enforced only in the case of such persons as are, in the exercise of the wide discretion which should be entrusted to the responsible officer, considered suspicious.

Restricting movement of people not the main object.

In addition to the above criticisms the Government of India stated their conviction that these elaborate rules for the control of the movement of people from infected localities would be powerless to check the spread of the disease unless they were accompanied by stringent measures to suppress the malady within the infected areas. In the absence of such measures the compulsory detention of the inmates in infected localities tends to foster the growth of the epidemic, and to establish plague foci whence the disease may not improbably spread with even greater virulence than if no measures had been devised to prevent the egress of the inhabitants. They, therefore, impressed upon the Government of Bombay that the most important object to aim at is, not the control of the movement of the people, but the adoption of such well-devised and stringent measures as will prevent the occurrence of plague cases from engendering fresh dangerous plague centres, whence the infection will certainly spread in spite of all efforts to confine it.

Protection of the Surat district against Daman.

An interesting subject to notice in connection with the discussion of land quarantine is the treatment of the Portuguese territory of Daman at the time of the virulent epidemic of plague which prevailed there from March to June. At ordinary times the communication between the British villages and those in the territory of Daman is free and constant, not only by reason of the contiguity of the villages and the kinship and caste brotherhood of their inhabitants, but because a large number of persons habitually go from British into Daman territory to drink the liquor which is more cheaply bought there than at the shops on the British side of the frontier. On the 30th of March the Collector of Surat, with the previous sanction of the Commissioner of the Northern Division, imposed a strict land quarantine against the whole of Daman territory by means of a cordon formed by the frontier guard of the

Original strict quarantine.

Cordon of the Salt guard.

Salt Department under the control of Mr. Judge, Assistant Collector of Salt Revenue. When the cordon was first formed it was utilised to stop almost all communication between Daman and the Pardi Taluka of the neighbouring British district of Surat. In the latter part of April the regulations were somewhat relaxed by the Commissioner, with a view to prevent the suffering which their continuance in the original form would have entailed on the inhabitants of Daman. The following were the principal modifications made in the original stringent rules:—

First relaxations of the rules.

(1) An observation camp was established on the cordon line on the 9th May, in which people desiring to leave Daman were kept under observation for ten days before being allowed to enter British territory.

(2) Exemption was allowed in the case of Portuguese officials and persons having cogent reason to cross the frontier, provided they were free from plague.

(3) Authenticated Portuguese subjects and medical men of any nationality were allowed to enter Daman.

(4) Entry was permitted in the case of goods arriving for Daman at the Daman road station, and two agents were appointed for each of the divisions of Big and Little Daman to remove the goods.

(5) The entry into Daman of grass, grain, firewood, cattle for slaughter, and mhowra flowers, was permitted by road, the goods being removed from British to Portuguese carts at a post on the cordon line.

Writing on the 23rd April Mr. Judge remarked that the people were panic-stricken, and that were the cordon removed they would flock over the border into British territory.

Objections taken by the Government of India.

The Government of India considered that even the modified regulations were more stringent than was proper or necessary, and that they were opposed to the principles on which preventive measures should be based. On the 26th May they telegraphed to the Government of Bombay that the proper course was to institute a system of inspection by medical officers who should have authority to stop all suspicious persons and to detain them under observation. For this purpose, the Government of India remarked that it was essential that there should be segregation camps capable of accommodating suspicious persons of all classes, and enquiry was made whether sufficient accommodation had in fact been provided. The Government of India further stated that they were of opinion that restrictions as to the transport of goods should be removed. On the 17th of June the Government of Bombay forwarded a memorandum drawn

up by Mr. Lely, the Commissioner of the Northern Division, explaining the modified precautions that had been adopted. The Government of India agreed that the regulations described by Mr. Lely were not open to objection. The sketch of the Daman frontier given in Volume IV (page 20) accompanied Mr. Lely's report. The dotted line in the sketch shows the cordon as it is ordinarily maintained for salt and customs preventive purposes; in order to protect all British villages the cordon was, for plague purposes, transferred to the line marked in chain dot along the territorial frontier. To provide for the greater length of frontier the strength of the guard was increased from 260 to 320 men. The following is the account of the modified precautionary measures given by the Commissioner:— Further relaxation of the rules.

(1) All Portuguese subjects were allowed to pass into Daman without question, and also all British subjects who had reasonable cause for going there. Every one was warned at the time of entry that they ran the risk of being detained under observation on their return. It is stated that this operated as an effectual check. The only people who were prevented from entering Daman were British subjects who desired to cross the frontier to obtain cheap drink. Persons allowed to enter Daman.

(2) The cordon round the frontier was used to divert all traffic into the road leading out of Daman territory *viâ* the village of Chola, where the observation post and camp were situated. All persons not suspected, such as persons from Big Daman, where the Governor's Fort stands, were allowed to pass out of Daman after medical examination; but all who came from Little Daman and the neighbouring villages were treated as *prima facie* suspicious. The Commissioner states that considering the extent to which Little Daman was impregnated with plague no other presumption was possible. Up to the end of July 400 persons were allowed to pass out of Daman without detention. For all suspicious persons comfortable residential sheds were provided on the road near Chola. The post was furnished with a provision shop, good well water, and an isolation hospital for treatment of the sick. The clothes and personal effects of the persons detained in the camp were divided into two heaps—one to be burnt or sent back at the option of the owner, the other to be disinfected by boiling. After selecting a suit of clothes that had been boiled and dried, the owner went to a healthy shed, and after taking a Observation post and camp on the frontier.

disinfecting bath put on clean clothes and threw those he was wearing over the fence, whence they were carried away and disinfected. He remained ten days under observation and then, if found healthy, was allowed to depart. The Commissioner on paying a surprise visit to the camp found the inmates cheerful and healthy. He states that there was ample accommodation for all who desired to pass through the camp. The amount of accommodation was gradually increased until it was sufficient for one hundred persons. The number of occupants varied considerably; during the height of the epidemic it appears to have been generally between fifty and a hundred.

**Passage of goods into Daman.**

(3) On the passage of goods there was no embargo. Passes were granted to twelve agents selected by Mr. Judge and the Governor of Daman, who were allowed to take delivery of parcels at the railway stations and to bring them into Daman. The only limitation on the transport of goods into Daman was that carts and cartmen had to be changed at one of the two frontier stations of Chola and Patharpunja. The Commissioner states that the arrangements were simple and effective, and the fact that traffic was confined to two routes occasioned no inconvenience, since under the Land Customs Act only these two routes are open to goods traffic in ordinary times.

**Guarding of the cordon line.**

The arrangements made by Mr. Judge for guarding the cordon line were careful and elaborate. Along the whole 38 miles to be guarded a path was demarcated and made practicable for patrolling by night and day. There was a guard-house about every mile along the line, and special precaution was taken at the places where roads intersected the cordon. The whole of the line was patrolled by sentries, who were constantly visited by their officers.

"You will thus see," said Mr. Judge, "that the line being strongly guarded by sentries about 1 to ¼ of a mile, constantly patrolled by Amaldars,* and regularly visited by the supervising staff, it was absolutely impossible for persons to get across during the day unperceived and next to impossible for them to do so at night.

"Now as all the roads were guarded, and as ordinary passengers would not be able to find their way over the fields at night and when in addition to finding their way, they would have had to evade a strongly guarded cordon, it will be seen that the task of crossing the cordon was, for ordinary persons, rendered impossible at night also, even for healthy persons.

* Officers.

"About 40 persons who attempted to evade the cordon at various times were detained and prosecuted and convicted.

"No persons have been arrested as having evaded the cordon by villagers, but the patels, etc., were put on the watch for them and would have done so had the necessity arisen, as they and their villagers, after they realised the danger from contagion or infection, became extremely keen on keeping their villages free from strangers.

"The best proof of the efficiency of the cordon and the co-operation of the villagers is the immunity of the Pardi taluka, and especially the frontier British villages when compared with the 3,000 cases of plague that have occurred within the Daman territory."

Additional precautions.

In addition to these precautions on the frontier passengers were inspected at the neighbouring railway stations of Pardi, Daman Road, Udvada, and Bhilad. At Pardi suspicious persons were detained under observation for ten days, and segregation hospitals were also established at Daman Road and Udvada. The surrounding inhabitants were informed that they might prevent suspicious persons from entering their villages, and the Commissioner reports that they availed themselves largely of this means of protection. It is stated by the Commissioner that the measures adopted succeeded in protecting the Pardi taluka from the great danger to which it was exposed, and that during the period of the epidemic only one endemic case was discovered in the taluka.

Further history of the stoppage of third class railway traffic.

The following is the further history of the proposal to stop third class railway traffic from infected districts.

Punjab.

To protect the Punjab the inspecting officer at Khanpur station was directed to exercise a wide discretion in stopping suspicious persons travelling from the direction of Sind.

Rajputana.

To protect Rajputana the Government of Bombay were requested to prevent all suspicious persons from leaving Palanpur by rail or road until they had been subjected to a period of observation, and the Agent to the Governor General was directed to detain and keep under observation all suspicious persons arriving from Palanpur.

Sukkur.

On the 3rd April, plague having become virulent in Sukkur, the Government of Bombay informed the Government of India that the Commissioner in Sind had stopped second, intermediate and third class railway traffic to stations in the Punjab and Baluchistan from Sukkur and the neighbouring stations of Bagarji, Rohri, and Sangi, except under written permission of the Sukkur-Rohri Plague Committee. The Government of India replied that they considered it would be sufficient to examine all passengers booking at Sukkur, the inspecting officer being given wide discretion to retain under

observation all suspicious persons. Railway communication was accordingly re-opened.

Rohri.

Later on the plague having spread to Rohri and other stations in the Shikarpur district, the Government of Bombay informed the Government of India that the District Magistrate had prohibited all booking, except with the permission of the Plague Committee, from Sukkur and Rohri, from stations between Sukkur and Shikarpur on the branch of the North-Western Railway leading to Baluchistan, from stations between Rohri and Reti on the branch leading to the Punjab, and from stations between Rohri and Setharja, inclusive, on the chord line to Kotri. The Government of India objected to these arrangements, and suggested that passengers leaving Rohri should be examined in the manner prescribed for Sukkur; persons travelling from Rohri towards Baluchistan being inspected at the Indus crossing. After some further correspondence these instructions were carried out, and the closed portion of the line was re-opened, except at stations between Rohri and Tando-Mastikhan on the Rohri-Kotri chord and between Rohri and Pano Akil on the line leading to the Punjab. The stations on these portions of the line were kept closed for some time longer to prevent persons booking from stations in the immediate neighbourhood of Rohri in order to avoid examination at that place.

Baluchistan.

Another proposal to impose quarantine against railway travellers was made by the Agent to the Governor General in Baluchistan towards the end of March. He stated that there was serious sickness of plague extending to Quetta from the infected districts of Sind, and strongly recommended that quarantine should be imposed at Jacobabad on all native third class and intermediate passengers for Baluchistan from Sind. He pointed out that, with quarantine on railway passengers at Jacobabad, it would be almost impossible for plague to reach Baluchistan owing to the intervening desert. In reply the Government of India explained their objections to the imposition of land quarantine, and stated they had refused to allow it in other places in India. They remarked, however, that the fact that the desert has to be crossed would render effective quarantine easier for Baluchistan than elsewhere, and they stated that in view of the possibility of plague advancing by Baluchistan to Afghanistan political considerations might outweigh the general consideration against land quarantine. The Agent to the Governor General was further informed that if quarantine were imposed at all, it should be within the Baluchistan border and not in Sind, that it must apply to all passengers by whatever class they travel and whatever their race, and that separate camps for each day's arrivals as well as segregation hospitals must be provided

As an alternative it was suggested that a commissioned medical officer should be appointed to an inspection station in Baluchistan with wide discretion to detain the suspicious. The Agent to the Governor General replied that quarantine in the manner described by the Government of India appeared to be hardly practicable, and that he was taking steps to give effect to the alternative suggestion.

Arrangements at the Sibi inspection station.

An inspection station under the charge of a commissioned medical officer deputed by the Government of India was accordingly established at Sibi, the junction of the Sind-Pishin and the Mushkaf-Bolan lines. On the 13th April the Agent to the Governor General reported that the arrangements were working well. A rigorous medical inspection had been instituted at Sibi under the supervision of the Commissioned Medical Officer and the Assistant Political Agent. In exercise of his discretion, and with the approval of the Agent to the Governor General, the medical officer detained as suspects all native passengers from infected places in Sind unless they produced a certificate from the Plague Committee of the place of departure, or other proof that they had come from a non-infected quarter. Other passengers travelling in the same carriages as suspects were merely detained for a few hours for disinfection. As numerous refugees from Sukkur were found alighting at the desert stations between Sibi and the Punjab border and fleeing into Kalat territory, orders were issued prohibiting them from alighting and requiring them to proceed, in the first place, to Sibi for examination. The Agent to the Governor General reported that these arrangements were cordially approved by all classes of the community, even by those whose families were detained. On the 12th April, the observation camp having then been working for a fortnight, the number of persons in the camp was 304. This was the maximum, as the exodus from Sind had already began to decrease, and the plague soon afterwards abated.

Proposals made during the recrudescence.

At the time of the recrudescence at Palanpur the Agent to the Governor General in Rajputana again proposed (September 1897) the stoppage of booking from Palanpur and neighbouring stations, and the proposal was again negatived. A similar proposal was made at about the same time with regard to booking from Poona and Sholapur to stations on the Nizam's Guaranteed State Railway in the direction of Hyderabad, and was also negatived.

## Inspection of Railway Passengers.

Early arrangements.

The importance of inspecting persons travelling by rail from the seat of the plague was recognised from the outset, and arrangements

were made to inspect passengers and segregate the sick as soon as it became clear that plague had taken a hold on Bombay and showed a tendency to spread to other places.

Co-operation with railway administrations.

The first arrangements were made by the co-operation of the civil with the railway authorities, who were directed to take action under sections 47 and 71 of the Railways Act, IX of 1890. The following is a brief history of the early measures.

Arrangement in Bengal, the North-Western and Central Provinces.

On the 1st of October the Government of Bengal addressed the Government of the North-Western Provinces and the Chief Commissioner of the Central Provinces asking them to make arrangements for the examination of passengers and the removal of plague patients from the train should the disease increase in Bombay sufficiently to render this course necessary. It was suggested that the North-Western Provinces Government should arrange for inspection at Allahabad, and the Central Provinces administration for inspection at Nagpur and Jubbulpur. The Lieutenant-Governor stated that, on receiving intimation that these inspections were started, he would also arrange for inspection at Bankipur and Burdwan. The Government of the North-Western Provinces replied that inspection at Itarsi would be more useful than inspection at Allahabad, and that it was prepared to support an application for inspection at this latter place. The Chief Commissioner of the Central Provinces agreed to the proposals of the Bengal Government with regard to Nagpur and Jubbulpur, and, on the 5th October, enquired of the East Indian and Bengal-Nagpur Railway Administrations whether they would co-operate for establishing the inspection posts should circumstances render their institution necessary. The Bengal-Nagpur Railway Administration agreed to the proposal. The East Indian Railway Administration replied that passengers were already being examined at Allahabad, Tundla, and Assansol, and that inspection at Assansol was preferable to inspection at Jubbulpore since trains from Bombay passed this latter station during the night. The orders instituting inspection at Allahabad, Tundla, and Assansol were issued

Orders issued by the East Indian Railway Administration.

by the East Indian Railway Administration on the 1st October. The orders stated that native doctors should accompany ticket-collectors on their rounds, that their attention should be drawn to passengers with tickets from Bombay, and that if plague cases were discovered the staff should take action under the orders of the Medical Department. At the same time that he addressed the railway administrations, the Chief Commissioner of the Central Provinces issued instructions to his Administrative Medical Officer. He directed that arrangements should be made to provide an Assistant Surgeon and a well qualified hospital assistant at both Itarsi and Jubbulpur, that

medical and ambulance arrangements should be got in readiness, and that temporary hospital accommodation should be provided.

On the 6th October the Government of Bengal informed the Chief Commissioner of the Central Provinces that the Government of the North-Western Provinces suggested Itarsi as an inspection station, and asked whether the Chief Commissioner would arrange to establish an inspection station at that place. The Chief Commissioner enquired of the Great Indian Peninsula Railway Administration whether it would co-operate for this purpose. The administration replied in the affirmative on the 13th October, but stated that the abatement of the plague in Bombay rendered inspection unnecessary at that time. About the same time the Bombay, Baroda and Central India Railway Administration issued orders for assistance to be given to the civil authorities for the establishment of inspection stations at Ahmedabad, Anand, Wadhwan and Ajmere. The Government of India informed the Governments of the North-Western Provinces and Bengal and the Chief Commissioners of the Central Provinces and Ajmere-Merwara of these arrangements, and directed the Ajmere Administration to render the necessary assistance.

Order issued by the Bombay, Baroda and Central India Railway Administration.

On the 3rd October the Government of India telegraphed to Bombay urging immediate co-operation with railway administrations under sections 47 and 71 of the Railways Act for the detection of cases of plague by instituting a careful inspection of passengers at all junctions and large stations where trains halt. It was stated that the assistance of officers of the subordinate medical establishment should be given for the examination of passengers and the treatment of the sick. The Government of Bombay replied on the 21st October that the orders of the Government of India had been communicated to the railway and medical authorities concerned. They also stated that the Municipal Commissioner of Bombay, who had arranged for inspection at stations in the city of Bombay, considered that the abatement of plague rendered it unnecessary to examine passengers at Bombay. On the 23rd of October the Government of India telegraphed that they did not consider that the statistics showed an abatement of plague sufficient to render it unnecessary to examine railway passengers. They desired that immediate arrangements should be made in communication with the Great Indian Peninsula and the Bombay, Baroda and Central India Railway Companies for medical inspection at large stations and junctions where such inspections could be made without inconvenience to traffic. It was stated that the inspection should be carried out at Bombay itself, at Itarsi, at Ajmere, and at other places where the precaution was considered necessary. The Government of Bombay stated in reply that arrangements for the

Instructions issued by the Government of India to the Government of Bombay.

**Arrangements made by the Government of Bombay.**

medical inspection of passengers had already been made at most important stations in the Presidency, and that arrangements at other stations were also being made. The Chief Commissioner of the Central Provinces informed the Government of India on the 27th October that on receipt of information from the Government of Bombay instructions had issued for the examination of passengers at Itarsi. On the 30th of the same month the Chief Commissioner of Ajmere-Merwara was informed by the Government of India that inspection should be enforced at Ajmere.

**The Central Provinces and Ajmere.**

**Extension of the arrangements.**

The arrangements existing at the end of October were gradually extended and made more stringent, as the increased virulence of the epidemic in the Bombay Presidency rendered the danger of the spread of the disease more imminent.

**Arrangements on the East Indian Railway.**

Writing on the 24th of November the Chief Medical Officer of the East Indian Railway Administration gave the following description of the precautions taken on that railway:—

"(1) On each district one native doctor inspects all trains from Bombay. At Allahabad and Assansol special men have been appointed for this duty.

(2) In the event of any suspicious case being found, the patient is removed at once to the Contagious Diseases Hospital, and the carriage in which the person was travelling is cut off and disinfected.

(3) The carriage also is cut off and disinfected at the first station where there is a medical officer or native doctor after the last passenger has left it.

(4) The address of all passengers travelling in the carriage is taken and telegraphed to the Station Master at their destination for information of the local authorities.

(5) While in hospital every precaution is taken to isolate the patient completely, and for this the assistance of the police is obtained, if necessary.

(6) On leaving hospital the patient's clothes are burned, also all bedding, etc., and the hospital disinfected.

(7) The medical staff take the same precautions regarding the disinfection of themselves as they do when attending a case of small-pox.

(8) All cases are immediately reported to the Chief Medical Officer.

(9) The medical staff pay increased attention to the sanitation of their stations."

**Later arrangement of the Government of Bombay.**

The Government of Bombay informed the Government of India on the 26th January that hospital assistants had been deputed at the principal railway stations in the Presidency to inspect, with the

co-operations of the railway authorities, passengers from Bombay, and that arrangements had been made to segregate in isolated sheds and hospitals provided by municipalities any cases of plague that were detected. Many cases which might otherwise have spread infection were detected and detained in this manner. Plague having attacked Ahmedabad and several cases having been imported by rail to places beyond that city, the Government of India deputed a military hospital assistant at the end of January to conduct the inspections at the Ahmedabad station. On the 5th January the Government of the Punjab sanctioned the establishment of inspection stations at Bhatinda and Rewari for the inspection of passengers from Bombay and the infected districts. For some time before this date a special hospital assistant had been present at Delhi for the examination of railway passengers, and instructions had also issued for the establishment of isolation hospitals at Lahore and Multan. The Government of the North-Western Provinces issued instructions to its Inspector-General of Civil Hospitals on the 28th January to take steps to make the inspections more stringent. Several cases having eluded observation, it was feared that the arrangements were, to some extent, defective. At this time arrangements had been made for inspection at Allahabad, Moghul Sarai, Ghaziabad, Saharanpur, and Cawnpore. At most of these places suitable hospital accommodation existed, and orders were given to provide such accommodation where it had not already been provided. Instructions were issued for the removal of persons suspected to be suffering from plague, and for their detention in an observation shed or temporary hospital. The friends and attendants of the sick were to be segregated, and all sick persons arriving from infected districts were to be considered as suspicious and detained. On the 2nd of February the Chief Commissioner of the Central Provinces reported that inspection by medical officers of the provincial cadre was carried out at Jubbulpore, Itarsi, and Nagpore. Temporary hospitals had been provided and special establishments entertained. The Government of Madras reported on the same date that passengers from Bombay were inspected at the suburban station of Perambur, and that their addresses having been taken they were subjected to a ten days' surveillance. Infected persons were to be taken to isolated sheds for treatment. Inspection was also carried out and special hospitals were provided at the stations of Adoni, Bezvada, Guntakal, and Raichur. Circular orders had been issued requiring District Surgeons to arrange for the examination and observation at all railway stations in the Presidency which are junctions or which are situated in municipal towns. In reply to an enquiry made by the Government of India the Agent to the Governor-General in Rajputana

Ahmedabad.

The Punjab.

The North-Western Provinces.

The Central Provinces.

Madras.

Rajputana.

reported on the 6th February that passengers were examined at Abu Road, Marwar Junction, Beawar, Ajmere, Jaipur, and Bandikui.

**Precautions against Karachi.**

Plague having been declared epidemic in Karachi towards the end of December, it became necessary to adopt precautions to prevent the spread of infection from this new centre. The rest of Sind was immediately threatened, then the Punjab, and beyond the Punjab, Baluchistan, and the North-Western Provinces. The Government of India telegraphed to the Government of Bombay on the 29th December requesting that arrangements might be made for the inspection of railway passengers at Karachi and at principal stations on the line leading from Karachi, of the same nature as the arrangements in force to prevent the spread of plague from Bombay. On the following day similar instructions were issued to the Governments of the Punjab and of the North-Western Provinces and Oudh and to the Agent to the Governor General in Baluchistan.

**Orders issued by the Government of India.**

**Arrangements in Sind.**

The Commissioner in Sind at once directed the following Civil Surgeons to arrange for the inspection of passengers arriving from Karachi at stations in their districts, and to isolate any person discovered to be suffering from plague:—

The Civil Surgeon, Karachi (City and Cantonment Stations).

The Medical Officer, North-Western Railway, Kotri (including Dadu, Laki, Hyderabad, and Pad Idan).

The Civil Surgeon, Sukkur (including Rohri, Ruk, and Keti).

The Civil Surgeon, Shikarpur.

The Civil Surgeon, Jacobabad.

The hospital assistants at the following stations were also instructed to inspect passengers:—

Sehwan, Tando Adam, Mirpurkhas, Larkana, and Ghotki.

Examination of passengers at the Karachi railway station was already in force.

**Special instructions issued by the Commissioner in Sind.**

A circular to district officers was issued by the Commissioner in Sind on the 10th January, summarising the measures that had been adopted, and stating the points with regard to which particular care should be taken. Attention was specially called to the following matters. When suspect cases were discovered at stations where there were no arrangements for segregation and treatment, the sufferer was to be sent on (without extra charge) to the nearest station where such arrangements were ready. The relatives and friends accompanying the patients were to be kept under observation. Care was to be taken to prevent the removal of sick persons at wayside stations with a view to avoid inspection. Instructions were given to provide suitable accommodation, where this had not already been

done, for the segregation of the suspicious and for the treatment of the sick. The Commissioner had only heard of accommodation being provided at Jungshahi and Sehwan, and directed that accommodation should also be provided at Kotri, Dadu, Larkana, Sukkur, Rohri, Shikarpur, Jacobabad, and at Gidu Bandar or Hyderabad. Care was to be taken to provide the persons segregated with necessaries, to keep them as comfortable as possible, and to prevent their having intercourse with the outside world. The Commissioner also instituted a system of travelling European inspectors, whose duty it was to help medical officers in detecting sick persons, and to see that such persons were treated in accordance with the prescribed rules.

The Punjab. Decision of conference adopted by Local Government.

In the Punjab a conference was held on the 3rd January, attended by principal administrative, railway and medical officials, to devise measures to protect the Punjab against the spread of infection by railway from Karachi (the rest of Sind was at this time still uninfected). The Government of the Punjab passed orders approving the measures proposed by the conference, and directing that they should be carried out. The following is an outline of the measures.

Inspections were to be held at Khanpur (situated in Bhawalpur territory, about 70 miles from the Sind frontier), Sher Shah and Raewind. In fixing the places the conference was guided by the following principles. The station should be one at which trains ordinarily stop for a considerable time, it should be one at which trains from Karachi arrive during the day-time, and it should not be close to a large town. Khanpur was to be the principal inspection station and there the inspection was to be conducted by a commissioned medical officer. At the other post special hospital assistants were to be appointed. The following instructions were given for the conduct of the inspections. The doctor should go round with the ticket-collector and look at all passengers who had booked from Karachi or Sukkur (the last place was included in order to provide against re-booking). Other passengers looking ill should also be inspected. Suspicious cases should be removed from the train and isolated in temporary accommodation, separate accommodation being provided for the treatment of the sick. Passengers alighting should be treated in the same way. Special establishments should be entertained as required, and the persons segregated should be dieted and treated gratuitously. In sanctioning the proposals the Lieutenant-Governor enjoined that special caution should be taken in the treatment of females, and that a commissioned medical officer should, in all cases, see the patient as soon as possible. Shortly after the issue of these general orders, the Punjab Government issued subsidiary orders prescribing the procedure to be adopted in the case of Europeans and Eurasians,

and the precise method in which hospital sheds should be constructed.

The North-Western Provinces.

In reply to the telegram of the Government of India of the 30th December the Government of the North-Western Provinces reported that it had ascertained that due precautions had been taken in the Punjab, and that arrangements had been made with the Manager of the North-Western Railway and the Agent of the East Indian Railway for the examination of passengers changing into the East Indian Railway at Umballa and Ghaziabad stations. Travellers from Karachi enter the North-Western Provinces at Saharanpur (*viâ* Umballa) or at Ghaziabad (*viâ* Delhi). In addition to the other precautions the Government of the North-Western Provinces posted hospital assistants at both Saharanpur and Ghaziabad, and caused suitable segregation shelter to be erected at these places. The necessary directions for the treatment of patients were issued to the Civil Surgeons of the Saharanpur and Meerut districts.

Baluchistan.

In Baluchistan the medical officers at Sibi, Sharigh, Bostan, Chaman, and Quetta were instructed to examine passengers in trains arriving from Sind, and to provide suitable hospital accommodation for persons found to be suffering from plague.

Extension of the arrangements after the passing of the Epidemic Diseases Act.

The above account brings the narrative of events up to the time the Epidemic Diseases Act was passed. Immediately after that Act attained the force of law the railway inspection arrangements were systematised and largely extended, until an elaborate and far-reaching plan was evolved ensuring a thorough inspection of every traveller from the infected districts at different points along his routes to other portions of India. This system, as perfected in the light of gradually increasing experience, may claim to afford the greatest possible protection against the spread of disease along the lines of communication, combined with the least possible interference with intercourse and commerce.

The working of the system after the introduction of the Epidemic Diseases Act must be described in some detail.

Clause of the Epidemic Diseases Act relating to examination of travellers.

The following is the wording of the special clause [section 2, sub-section 2, clause (*b*)] of the Epidemic Diseases Act, which deals with the treatment of travellers :—

"In particular and without prejudice to the generality of the foregoing provisions the Governor General in Council may take measures and prescribe regulations for—

* * * * * *

"(*b*) The inspection of persons travelling by railway or otherwise, and the segregation in hospital, temporary accommodation, or otherwise, of persons suspected by the inspecting officer of being infected with any such disease."

On the date that the Act was passed, the Government of India telegraphed to the different Local Governments and Administrations repeating its terms, and in doing this gave special directions with regard to the inspection of railway travellers. It was stated in the telegraphic circular that it was essential that the medical inspection of passengers in trains coming from the direction of infected districts should be complete, and that this could only be effected by the removal of the passengers from the train and their inspection by a medical officer on the platform; also that this duty should ordinarily be performed by a commissioned medical officer. The Government of India suggested the following series of principal inspection stations for the different provinces, and stated that the arrangements at these stations need not interfere with the subsidiary inspections of a less complete character already ordered by the Local Governments and Administrations:—

Instructions issued by the Government of India on the passing of the Act. Appointment of principal inspection stations and method of examination at such stations.

*In Bombay and Sind.*

Stations suggested by the Government of India.

Kalyan ... } On the Great Indian Peninsula Rail-
Bhusawal ... } way.

Palghar ... } On the Bombay, Baroda and Central
Anand ... } India Railway.

Karachi ... } On the North-Western Railway.
Ruk ... }

Hubli ... On the Southern Mahratta Railway.

*In the Central Provinces.*

Itarsi ... On the Great Indian Peninsula Railway.

Bilaspur ... On the Bengal-Nagpur Railway.

*In the North-Western Provinces and Oudh.*

Naini ... On the East Indian Railway.

Jhansi ... On the Indian Midland Railway.

*In Bengal.*

Assansol ... On the East Indian Railway.

*In the Punjab.*

Raewind ... } On the North-Western Railway.
Mahmud Kot }

*In Rajputana.*

Bandikui ... On the Rajputana-Malwa Railway.

*In Madras.*

Perambur ... On the Madras Railway.

Guntakal ... On the Southern Mahratta Railway.

**Subsequent alterations in and extension of the scheme.**

Some of these stations were subsequently altered in communication with the Local Governments, who also extended the system of both principal and subsidiary inspection stations. In the end the long series of inspection stations shown in the list in Appendix VIII, was established. The inspection stations are shown also in the railway map contained in Volume IV (page 16). At the principal inspection stations (shown in red on the map) a thorough examination was made of through passengers or of passengers alighting at important centres of population as the case might be, and all suspicious persons were detained; at the subsidiary inspection stations (shown in blue) a less thorough inspection was made, but there were arrangements for the detection and removal of sick persons and for the treatment of plague cases in isolation hospitals.

**Account of the principal inspection stations on the main lines of communication.**

The following brief account explains the situation of the principal inspection stations on the main lines of communication.

**Bombay to Calcutta.**

In the first place all passengers from Bombay were inspected before departure. On the line from Bombay to Calcutta *viâ* the Great Indian Peninsula and East Indian Railways the first principal inspection station was at Kalyan (one hour and twenty minutes from Bombay), the second was at Manmad junction near the Hyderabad border, the third was at Bhusawal junction near the Berar and Central Provinces borders, the fourth was at Itarsi junction in the Central Provinces, the fifth was at Sutna in the Central India Agency, and the sixth and last was at Khana junction near Burdwan in Bengal (three hours from Calcutta by the loop mail).

The inspection station was transferred to Sutna from Manikpur junction in the North-Western Provinces at the beginning of May, the scarcity and badness of the water-supply at Manikpur having made it impossible to continue the inspection at that place.

**Approach to Calcutta *viâ* the Great Indian Peninsula Railway and to the North-Western Provinces *viâ* the Indian Midland Railway.**

The approach to Calcutta through the Central Provinces and Chota Nagpur *viâ* the Great Indian Peninsula and Bengal-Nagpur line was guarded by a first class inspection station at Nagpur. The approach to the North-Western Provinces from Itarsi *viâ* the Indian Midland Railway was protected by a first class inspection station at the junction of Jhansi in the North-Western Provinces. An inspection station was established at Katihar junction in the Purneah district of Northern Bengal to protect the route to Calcutta from the north *viâ* the Bengal and North-Western and the Eastern Bengal Railways.

**Approach to Calcutta *viâ* the northern route.**

**Trains travelling northwards from Bombay and Bhusawal.**

Trains travelling northwards from Bombay *viâ* the Bombay-Baroda Railway were first inspected at Palghar (about three hours from

Bombay by fast passenger train) and then at Ahmedabad in the north of the presidency. Trains travelling northwards from Bhusawal junction through Central India and Rajputana by the Rajputana-Malwa Railway were inspected at Rutlam junction in the Central Indian Agency. The Rutlam inspection station also served for the examination of passengers travelling eastwards by the Bombay, Baroda and Central India Railway, a second principal inspection station at Ujjain protected both this route and an alternative route to the North-Western Provinces through Central India. The lines (Rajputana-Malwa Railway) running northwards from Ahmedabad and Rutlam converge at Ajmere in Rajputana, and here there was another principal inspection station. Beyond Ajmere there was a further inspection station for the protection of Northern and Western India at Bandikui, midway between Jaipur and the Punjab and North-Western Provinces borders.

Rutlam and Ujjain.

Ajmere.

Bandikui.

The line from Bombay to Madras *viâ* the Great Indian Peninsula and Madras Railways passes through the inspection station of Kalyan and then through Poona, which was the scene of a severe outbreak of plague. There was an inspection station at this place. The next principal inspection station was at Hotgi junction on the Hyderabad border. This station served for the protection of Hyderabad as well as for the protection of the route to Madras. Hyderabad was further protected by the inspection station at Wadi. There was another principal inspection station at Guntakal junction in the north-west of the Madras Presidency, another at Arkonam (an hour and fifty minutes from Madras), and lastly one at Perambur, a suburb of Madras City.

Bombay to Madras.

Hotgi.

To protect the route to the south of the Deccan *viâ* the Southern Mahratta Railway, an inspection station was established at Rajevadi (an hour and three-quarters from Poona by the mail), and another at Londa* junction near Goa on the main line from Castle Rock to Bezvada. At Bangalore also there was a principal inspection post for the protection of the civil and military station as well as for the inspection of through passengers. To protect the north of the Madras Presidency and Bengal from persons travelling from or through the south of the Bombay Presidency, there was a principal inspection station at Kondapalli, thirty-seven minutes from Bezvada on the Nizam's State Railway. At the instance of the Government of Bengal this station was moved to Bezvada junction during the time of the pilgrimage to Jagannath, with a view to form a midway inspection station for pilgrims travelling to Puri by the circuitous

The south of the Deccan.

Bangalore.

Kondapalli and Bezvada.

* During the recrudescence this station was transferred further north to Kudchi.

southern route. At other times goods only were examined at the Bezvada station by the civil apothecary superintended by the Civil Surgeon. As a further protection for Bengal against persons travelling by the new East Coast Railway, a principal inspection station was established at Khurda Road in the Puri district of Orissa. This station was of particular importance during the time of the pilgrimage to Jagannath.

Approach to Calcutta *vid* the East Coast Railway.

Sind.

In Sind there were principal inspection stations at Karachi, Hyderabad, Rohri, Sukkur, and Shikarpur. Persons entering the train at Hyderabad, Rohri, and Sukkur (in all of which places plague was at some time epidemic) were carefully inspected as well as persons passing through the stations from the direction of Karachi. The arrangements at Sukkur and Rohri have already been noticed in connection with the discussion on the stoppage of third class railway traffic.

Khanpur on the North-Western Railway.

Sher Shah.

Outside Sind the first principal inspection station for the protection of the Punjab was at Khanpur in the Bahawalpur State. A second station at the junction of Sher Shah (near Multan) protected the route to both the north-east and the north-west of the Punjab. The east portion of the Punjab and thence the North-Western Provinces, Kashmir, and the trans-frontier countries were further protected by a line of five principal inspection stations stretching right across the Punjab, north and south, from Kashmir to Rajputana. The names of these inspection stations were Jhelum, Wazirabad, Raewind, Ferozepore, and Bhatinda. The two lines of entry into the North-Western Provinces from the direction of the Punjab were further guarded by principal inspection stations at Saharanpur and Ghaziabad. These North-Western Provinces and south-east Punjab inspection stations served as an ultimate line of defence against the Bombay Presidency proper as well as against Sind. For the further protection of Simla a principal inspection station was established at the Kalka terminus and a minor inspection station on the cart-road.

Series of inspection stations across the Punjab.

Lines entering the North-Western Provinces.

Simla.

Baluchistan.

The last line of railway that remains to be considered is the branch of the North-Western Railway leading north-westwards from Sukkur through Baluchistan. For the protection of Baluchistan and the trans-frontier countries a first class inspection station was, it has already been stated, established at Sibi junction. In the middle of May the station was removed from Sibi to Sharigh on the northern or Sind-Pishin branch of the railway on account of the heat and bad water-supply at Sibi. This left the southern or Mushkaf-Bolan branch of the railway unprotected by a first class inspection station. This portion of the route was accordingly closed, except to first and second class passengers who were examined *en route*. It was explained

Sibi and Sharigh.

Mushkaf-Bolan line.

that there is hardly any traffic on the Mushkaf-Bolan Railway, and that this course therefore occasioned no inconvenience.

New inspection stations opened during the second outbreak.

During the period of the second outbreak, Khana, the Bengal inspection station, was abandoned in favour of the more convenient arrangement of three inspection stations on the borders of the province. The three stations were established at Mairwa on the Bengal and North-Western Railway, Chausa* on the East Indian Railway, and Chakardharpur on the Bengal-Nagpur Railway. To meet the danger arising from the spread of plague in the Deccan the following new principal inspection stations were opened :—

| | | | |
|---|---|---|---|
| *Madras* | ... | ... | Hospet. |
| *Central Provinces* | ... | ... | Burhanpur. |
| *Hyderabad* ... | ... | ... | Lingampadi, Gulburga and Malkapur. |

In the Bombay Presidency a principal inspection and disinfection station was also opened at Anand, south of Ahmedabad.

Arrangements within the Bombay Presidency.

Although for the purpose of devising precautions to protect the rest of India it was necessary, when plague had become epidemic in nearly every district in the Bombay Presidency and Sind, to treat the whole of the province as infected, all places in the Presidency were by no means equally infected. Whilst some towns and villages were the scene of virulent epidemic, many others escaped altogether or suffered only slight loss. To protect the uninfected against the infected localities, inspections were made of railway travellers at the time of starting from infected places, during the journey, and on arrival at other places in the Presidency, similar to the inspections instituted for the protection of other provinces.

Inspection of up-trains in and near Bombay.

Specially careful arrangements were made when the epidemic declined in the city of Bombay, and passengers from infected districts began to flock into the capital. A set of rules to meet this emergency were issued by the Government of Bombay on the 15th April, which were slightly modified on the 28th May. Up-trains to Bombay *viâ* the Great Indian Peninsula and Bombay, Baroda and Central India Railways pass through the principal inspection stations of Kalyan and Palghar, respectively. On the Great Indian Peninsula Railway persons travelling by up through trains were medically inspected at Kalyan, and the train was not again inspected, but no passengers were allowed to enter at any station between Kalyan and Kurla, except at Thana where they were inspected before being permitted to entrain. All local trains were emptied and their passengers medically inspected at Sion. On the Bombay, Baroda and Central India Railway up-trains starting from stations

* For plan of this camp, see Volume IV, page 17-A.

north of Bandra were stopped for the medical inspection of their passengers at Bandra, except in the case of the up mail trains, the passengers by which were inspected at Palghar. No person was allowed to book at Bandra station by up-trains until they had been medically inspected. Season ticket-holders and free pass-holders were ordinarily excused from inspection, but the plague authorities were permitted to inspect them in any cases in which they considered it desirable to do so.

**Arrangements for protection against Cutch-Mandvi.**

Another instance of protective arrangements within the Bombay Presidency is furnished by the measures adopted on the occurrence of the virulent outbreak in Cutch-Mandvi. In addition to arrangements for the quarantine of vessels arriving from Cutch at Bombay, Karachi, and other ports, and for the closing of some and the institution of observation posts on the remainder of the routes from Cutch into Kathiawar, special arrangements were made for the examination of railway travellers from Cutch at Wadhwan in Kathiawar and at Ahmedabad. At Wadhwan travellers were detained for twenty-four hours for inspection and disinfection of clothing.

**Method of inspection.**

The plan on which the series of inspection stations along the lines of communications was arranged having been explained, it remains to be described how the inspection was carried out under rules framed by Local Governments under the Epidemic Diseases Act.

**The Bombay Presidency.**

In the Bombay Presidency the arrangements were under the immediate control of Surgeon-Major Street, who advised the Government of Bombay and inspected the stations. The

**Rules issued by the Government of Bombay.**

rules issued for the principal inspection stations in the Presidency proper provided for the detention of the train until the completion of the inspection and until the guard in charge obtained a certificate from the Chief Medical Officer in charge of the inspecting staff to the effect that all persons proceeding further by the train, whether railway servants or passengers, were free from plague. The train was emptied for inspection in such manner

**Co-operation of the servants of railway companies.**

as the Chief Medical Officer on duty directed, and the servants of the railway company were directed to afford all facilities for the inspection of persons arriving (whether or not they intended to continue the journey) and of persons intending to start by the train. In particular the doors of all railway carriages were to be locked at the station at which the train last stopped before arriving at the inspection station.

**Detention of suspicious cases.**

The inspecting medical officers were empowered to examine all passengers arriving by or intending to leave by the train, and to detain persons suffering, or suspected to be suffering, from plague in

places appointed for the purpose. Hospital accommodation was provided for plague patients, and separate accommodation was furnished for suspected persons and for the medical staff. At minor inspection stations the officers appointed for the purpose were empowered to examine all persons alighting or intending to depart, and to detain at the appointed place all persons suffering, or suspected to be suffering, from plague. Europeans or natives of a class who could not be properly accommodated at the Palghar and Kalyan stations were to be sent back to Bombay and removed to one of the hospitals in the city.

Hospital and segregation accommodation. Minor inspection stations.

The arrangements for the major and minor inspection stations in Sind were similar to those enforced in the Presidency proper. The rules for the major inspection stations were drawn up in somewhat greater detail than the rules for the Presidency, and instructions for principal stations were issued to meet the special features and arrangements of each. It was specially provided in the Sind rules that the persons detained might be accompanied by relatives or friends, and attention was drawn to the arrangements that should be made for the comfort of the segregated, and for the proper treatment of females.

Sind.

Surgeon-Major-General Warburton (Officiating Sanitary Commissioner with the Government of India), who made a tour of inspection on the railways at the end of March, recorded the following notes on the inspection stations at Kalyan and Bhusawal. At Kalyan twenty scheduled trains were examined daily. The morning report showed that there were 15 persons in the observation sheds, and 19 cases in the plague beds. From the 13th February to the 29th March 301 persons had been detained. Of these 250 were suspects. Approximately 98 of the cases detained proved to be true cases of plague. Of these 63 had died, 16 had been discharged cured, and 19 remained under treatment. Dr. Warburton was present at the examination of three trains, and found that the inspection was carefully and properly conducted. At Bhusawal four trains, with about 700 passengers, were examined daily—at 8-20 and 9-16 A.M., and at 6-40 and 9-5 P.M. There were no trains to be examined during the night. The inspection of two evening trains at which Dr. Warburton was present was carefully performed. In the segregation camp there was accommodation for twenty plague cases and five suspects. There were two cases under observation, and three cases recovering from plague under treatment. Eleven other cases of plague, making 14 in all, had been detected and segregated, of these 7 had died and 4 had been discharged on recovery.

Tour of inspection made by the Officiating Sanitary Commissioner with the Government of India. Arrangements at Kalyan.

Bhusawal.

To carry out these numerous inspections of large bodies of travellers a considerable staff was required. A resolution issued by the

Staff.

Government of Bombay on the 26th February showed that the following staff was maintained at the principal inspection stations in the Presidency proper :—

*Kalyan station.*

2 Commissioned Medical Officers.
2 Military Assistant Surgeons.
2 Native Medical Practitioners.
14 Hospital Assistants.

*Palghar station.*

1 Commissioned Medical Officer.
1 Military Assistant Surgeon.
6 Hospital Assistants.

*Ahmedabad station.*

1 Commissioned Medical Officer.
1 Military Assistant Surgeon.
6 Civil Assistant Surgeons.
5 Stipendiary Pupils.
2 Civil Medical Pupils.

*Bhusawal station.*

1 Military Assistant Surgeon.
3 Hospital Assistants.

(When Dr. Warburton visited this place on the 27th March the staff consisted of—

1 Commissioned Medical Officer.
2 Military Assistant Surgeons.
5 Hospital Assistants.)

*Hotgi station.*

2 Military Assistant Surgeons.
3 Hospital Assistants.

*Londa station.*

2 Military Assistant Surgeons.
3 Hospital Assistants.

In May the total staff employed in the Presidency proper on railway inspection work consisted of—

9 Commissioned Medical Officers,
4 Private practitioners, and
74 Officers of the Subordinate Medical Service.

Female inspectors.

With a view to the examination of female passengers, female doctors or nurses were appointed at the stations named in the following list:—

| | | | | |
|---|---|---|---|---|
| Bhusawal | ... | ... | ... | 2 nurses. |
| Dadu | ... | ... | ... | 1 nurse. |
| Karachi | ... | ... | ... | 1 lady doctor. |
| Shikarpur | ... | ... | ... | 1 lady doctor. |
| Sukkur | ... | ... | ... | 1 nurse. |

At Kalyan it was found impossible to make arrangements for accommodating nurses or female doctors; and if the inspection of any female passenger raised a strong suspicion of plague, she was sent back to the Parel Hospital, Bombay, for examination.

Success of the Bombay arrangements.

The success of the elaborate system of inspection carried out in the Bombay Presidency is best shown by the very few cases of plague which were discovered beyond the limits of the province, amongst the enormous number of persons who travelled to other parts of India during the period of the epidemic.

The North-Western Provinces and Oudh general rules.

The rules issued by the Government of the North-Western Provinces and Oudh divide the railway inspection stations into three classes:—

(*a*) principal inspection stations;

(*b*) minor inspection stations with a hospital assistant in charge; and

(*c*) minor inspection stations with an officer of the vaccination department in charge.

Principal inspection stations.

Examination of passengers.

The rules for principal inspection stations provide, in the first place, for the detention of the train as long as may be necessary for the medical examination of the passengers. On arrival of the train at a principal inspection station passengers are required to remain in the train until permitted to alight by the railway police or a medical officer. They are then required to proceed for the purpose of examination to the place appointed for the purpose, there to remain until permitted to depart. The examination of female passengers was effected under the orders of the medical officer by a female medical practitioner or subordinate. Persons suspected to be suffering from plague are removed to the temporary observation shed and there detained under medical treatment. If the case proves to be a true case of plague, the patient is removed to the temporary hospital. The companions and attendants of patients are permitted to accompany them, and are required to reside in a segregation hut or tent in the immediate vicinity of the hospital. If any one amongst

Segregation of suspects and treatment of plague cases in hospital.

Companions and attendants.

them catches the plague, he is removed to the hospital. Upon the death of a patient the persons who have been in attendance on him are detained under observation for a further period of ten days. The corpse is disposed of under the orders of the medical officer. At minor stations in charge of hospital assistants the railway authorities are directed to allow sufficient time for the hospital assistant to examine the passengers who alight, and those who change carriages for the purpose of proceeding by another train. The arrangements for detaining suspected and declared cases, and other matters, are the same as in the case of the major inspection stations. At the other minor inspection stations officers of the Vaccination Department are posted to assist the station master in watching passengers. If at any of these stations a person travelling from the direction of the infected area is found to be suffering from plague, the station master is directed to arrange for his removal to the observation shed and for his detention there until he can be inspected by a medical officer. Any person desiring to accompany the sufferer is permitted to do so. The station master was directed to report the circumstances to the medical and district authorities, and the subsequent procedure is the same as at other inspection stations. At wayside stations, where no inspection officer is posted, persons suspected to be suffering from plague are permitted to proceed to the nearest station where a temporary hospital has been provided, the station master telegraphing to that station the details of the case, the name of the sick person, and the number of the carriage. If the person alights at the wayside station, he is removed to some isolated place, and the circumstances are immediately reported to the nearest police station and to the district and medical authorities. Temporary hospitals, segregation shelter, and accommodation for the companions of the sick have been provided at each of the inspection stations at which officers of the Medical or Vaccination Department were posted. For the proper supervision of the general arrangements the railway system within the limits of the province is divided into three circles, to each of which an inspecting medical officer is appointed. It is the duty of each medical inspector to travel frequently over the lines of railway included in his circle and to make surprise visits at least once a week to the principal stations. He is specially directed to examine the method adopted for the inspection of passengers, and the arrangements made to provide observation sheds, temporary hospitals, and segregation huts or tents. The Government of the North-Western Provinces and Oudh reported on the 5th of April that 11 commissioned medical officers, 9 assistant surgeons, and 15 hospital

**Minor stations in charge of hospital assistants.**

**Inspection of passengers alighting and changing trains.**

**Minor stations in charge of officers of the Vaccination Department.**

**Other wayside stations.**

**Inspection circles.**

**Staff.**

assistants had been detailed for plague duty; they were mainly engaged in the work of railway inspection. Female doctors or sub-ordinates were posted for the examination of female passengers at the following places:— Female inspectors.

| | | | |
|---|---|---|---|
| Bareilly | ... | ... | 1 Compounder. |
| Ghaziabad | ... | ... | 1 Nurse, 1 hospital assistant. |
| Ghazipur | ... | ... | 1 Nurse. |
| Haddwani | ... | ... | 1 Compounder. |
| Jhansi | ... | ... | 1 Ayah. |
| Manikpur | ... | ... | 1 Nurse. |
| Saharanpur | ... | ... | 1 Midwife. |

Dr. Warburton visited the Manikpur station (which was subsequently transferred to Sutna) on the 25th March and recorded the following remarks on the inspection:— Arrangements at Manikpur.

"Only two trains from the Bombay direction—one at 7-24 A.M. and the other at 7-5 P.M.—are examined each day. There are no night trains. I was present at the inspection of two trains, the total number of passengers examined being 360, of whom about 15 per cent. were from the Bombay Presidency.

"The examining staff consists of one commissioned medical officer, Surgeon-Lieutenant Dawes, and a native female nurse; the former examines all the men and feels the pulses of the females, whose examination is completed by the nurse. The examinations were carefully made. There were no purdah women and no complaints.

"One hospital assistant is in charge of the segregation camp and is present at inspections to take over any suspects or plague cases that may have to be detained. The camp consists of tents and huts for Europeans and natives with hospitals properly isolated; but, as only two suspects had so far been detained, the hospital assistant has had little to do. The small number of "suspects" at this station is probably due to effective inspections at Jubbulpur and Itarsi.

"The drinking-water is here the great difficulty. Europeans get theirs from Allahabad, and natives use water from the railway well and a neighbouring tank, both of which are drying up. The station is badly lighted.

"The medical officer keeps no diary. I have directed him to do so, entering the number of passengers examined each day, especially noting the number from Bombay, and to send a copy of the diary each week to his superior officer.

"The staff is sufficient and no new passenger is allowed to enter the train till the inspection is completed."

**The Punjab general rules.**

The rules framed by the Government of the Punjab provide in the first place that the inspecting medical officer may direct the passengers to alight and proceed for inspection to an appointed place on the platform or on the line. The inspecting officer is next permitted to make such medical inspection of the passengers as he may consider necessary, provided that the inspection must not be made in any manner or to any extent to which the person examined objects. The passenger is also bound to answer any questions put to him by the inspecting officer. If the inspecting officer suspects that the passenger may be infected with plague, or if the passenger refuses to be examined, the rules direct his detention in segregation in a place appointed for the purpose, until the danger of his spreading infection is over. Friends or attendants of persons segregated are permitted to accompany him, on the condition that they submit to retention in an appointed place. At stations where there is no inspecting officer the station master is directed to send any suspected case to the next inspection station.

**Inspection of passengers.**

**Segregation of suspect cases.**

**Friends and attendants.**

**Stations without inspecting officers.**

**Hospitals and staff.**

For the purpose of carrying out these rules plague hospitals were established at 59 inspection stations; and, during the height of the epidemic, the following medical staff were employed on inspection duty at the railway stations and at four road and ferry posts:—

27 Commissioned Medical Officers.
1 Uncovenanted Medical Officer.
2 Native doctors.
4 Military Assistant Surgeons.
12 Civil Assistant Surgeons.
40 Hospital Assistants.

**Female inspectors.**

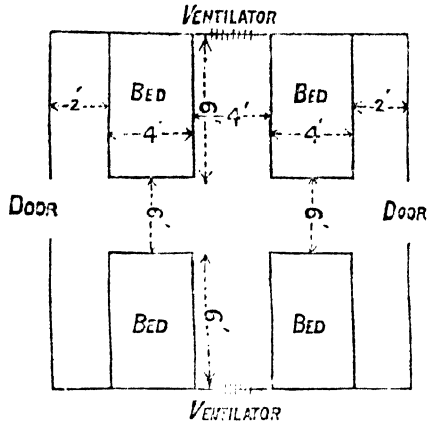
Female hospital assistants were appointed at the following stations:—

Khanpur, Kalka, Umballa, Raewind, Wazirabad.

**Hospital and segregation sheds.**

The Government of the Punjab prescribed a model plan for hospital and segregation sheds which will serve as an example of the nature of the temporary arrangements made at railway stations all over the country. The dimensions prescribed for a hospital shed for four patients were 18 feet by 16 feet, with side-walls, 8 feet high, and a sloping roof rising 6 feet above the walls. This gave a space of 600 cubic feet for each patient. The shed was provided with a mat door on each side-wall, 6 by 4 feet in dimensions, and with an opening

two square feet in size, with a mat shutter, at each end and placed about 5 feet from the ground. The following rough sketch shows the arrangement of the beds :—




The dimensions prescribed for the observation shed were 18 feet by 8 feet, and it was to be adapted for two beds. A moveable screen of thatch, 6 feet by 5 feet, was to be kept in readiness, so that if a female patient were admitted privacy could be effected. For the hospital assistant a hut of similar description and 12 square feet in size was prescribed. A small thatch work enclosure, without a roof, and about the size of an ordinary 'necessary' tent, was to be placed a few yards from the hospital tent. Directions were given that at first only two beds in the hospital shed and one in the observation ward should be equipped. For each bed two pairs of sheets, three country blankets, one mattress, and one pillow were to be provided. A tent with the necessary equipment was prescribed for European patients.

**Bengal general rules.**

The regulations issued by the Government of Bengal require passengers to submit themselves for examination. Persons suspected by the inspecting officer of being infected with plague are required to undergo segregation in hospital or in temporary accommodation for a period of not less than seven days, which may be reduced at the discretion of the inspecting officer. The rules direct that in conducting the medical inspection of females, and in arranging for their segregation, the inspecting officer should, as far as possible, have regard to the customs of the country. Arrangements were also prescribed for the erection of hospitals and temporary accommodation, for the supply of food and water to persons undergoing segregation, and for the proper sanitation of the place.

**Segregation of suspect cases.**

**Females.**

**Hospitals and temporary accommodation.**

**The Khana inspection station.**

The most important of the Bengal inspection stations during the first period of the epidemic, was that established at Khana junction on the main line between Bombay and Calcutta. Surgeon-Captain Dyson, Sanitary Commissioner of Bengal, under whose immediate direction the operations were carried out, has given a detailed account (dated the 12th March) of the arrangements at Khana, which is reprinted in Appendix VIII and is illustrated by the map in Volume IV (page 17).

**Arrangements in the observation camp.**

The observation encampment was divided into three portions: (1) the plague hospital, (2) the contact camp, and (3) the suspect camp. The contact camp was for the accommodation of persons found travelling in the same carriage with a plague patient, and the suspect camp for the accommodation of other suspicious persons. The plague camp consisted of—

(*a*) two structures, 45′ × 16′, which formed the native plague hospitals;

(*b*) six rooms, 10′ × 10′, for the families of the patient; and

(*c*) eight rooms, 8′ × 10′, for the hospital attendants.

There was also a small masonry building for European patients and accommodation for sweepers.

The plague hospitals contained accommodation for forty patients. The beds were of iron and iron platters and water-vessels were provided, all of which could easily be disinfected by heat. A Horbury's iron latrine was supplied and a Larrymore's incinerator. Very careful arrangements were made for the distribution of pure water from iron tanks.

In both the contact and suspect camps there were 75 huts, each 10′ × 8′, and accommodating two persons. Both camps were provided with a Horbury's latrine and a pure water-supply, and both were surrounded by a barbed wire fence.

**Inspection of trains.**

The inspecting staff consisted of two commissioned medical officers and two lady doctors; one medical officer and one lady doctor remaining on duty together.

Nine trains were examined daily, and on the date for which Dr. Dyson gives the information the number of passengers examined was 3,295. The account given by Dr. Dyson of the method of examination and the management of the camp is sufficiently important to deserve quotation at length.

**Examination of passengers.**

"Pending completion of the new platform, the examination of passengers takes place at the station. All passengers are required to alight and be examined—males by the medical officers and females by the lady doctors. A European station master, a European police

sergeant, two head constables, and nine constables attend each train. Of these, three constables are stationed on the up-platform to see that no person gets out on the wrong side of the train. In addition there are a number of railway *khalasis** present to open locked compartments, assist passengers to alight, etc. If any one is contumacious and declines to submit to the examination, time is not wasted arguing with him, but he is locked in and the carriage is cut off, and put into a siding, he being liable to the railway company for any loss or inconvenience they may sustain on this account. On the arrival of the train, ropes with hooks attached are fixed on to both ends of the first carriage and are held taut by the police. Male passengers are ranged in one or two rows nearest the ropes and facing the train. Female passengers are ranged on the platform near the train and facing it; their backs are thus turned towards the men. It has, however, been decided to examine them in future between *purdahs*† or *kanats*,† so as to shield them altogether from the public gaze. Care is taken to avoid wounding their feelings in any way, and the police are not allowed to handle them at all. The police sergeant or station master having reported that the compartments are empty, inspection of each passenger and his ticket begins. In a large number of cases their axillæ, femoral, inguinal regions, and paroted glands are examined, and the temperature of all suspicious cases is taken.‡ Whilst the inspection of carriage No. 1 is being made, carriage No. 2 is emptied and the passengers prepared for inspection, and so on. After inspection passengers re-enter their compartments, women going first. No one is allowed to wander up and down the platform.

Suspects from Bombay.

"Passengers' tickets are examined at Assansol. As a result of that examination, the Sub-Inspector of Railway Police, Assansol, wires in advance to the Medical Officer and the Inspector of Police at Khana junction the number of Bombay passengers, the class in which they are travelling, and in the case of third class passengers, the number of their carriage. The tickets of third class Bombay passengers are made over to the guard of the train, and they themselves are put in the last carriage for easy disposal. Passengers from Bombay, Poona, or other infected centres 'suspected' by the medical officer are detained, and with their baggage are handed over to a constable for safe custody until the examination of the train is completed. If the medical officer has any serious doubt about a case, he orders the carriage from which it is taken out to be cut off and immediately disinfected. On the departure of the train, the medical officer takes

* Porters. † Screens.

‡ General orders were subsequently issued by the Government of India that it is unnecessary to examine the glands if the traveller presents no symptoms of fever.

charge of the suspect's ticket, notes down the name, age, sex, caste, place of residence, and infected place from whence the 'suspect' has come, and the number of the train from which he was removed. The station master on duty hands the inspecting medical officer a slip showing the number of passengers examined (*a*) 1st and 2nd, (*b*) all other classes, (*c*) total. The inspection is then complete, and the train is allowed to go on.

**Disposal of suspects.**

"The 'suspects' and their effects are then handed over to the European police sergeant on duty with any special instruction the medical officer may desire to give, and the latter arranges for their escort to the camp.

"The camp staff consists of—

1 Military Assistant Surgeon.

3 Civil Hospital Assistants, and menial staff—cooks, bhisties, mehters, etc.

"On arrival at the camp the 'suspects' are made over by the police constable to the Assistant Surgeon in charge, who tells them off to their proper camp, locates them in a numbered hut, provides them with bedding, *i.e.*, straw, mat, or *taktaposh** as desired, explains the rules of the camp, and finally leaves them in charge of the hospital assistant in charge of that particular camp. The hospital assistant examines them, takes their temperature, and is responsible that the first signs of any illness are reported, that they are present on various parades, and that their wants as regards water, food, etc., are attended to without hurting their caste prejudices. The information regarding the 'suspects' noted by the inspecting medical officer is made over to the camp clerk and duly entered in the 'release diary' of the officer in charge of the camp, and their tickets are duly filed until their release.

**The camp.**

"The camp is under the immediate control of the Assistant Surgeon, who parades the menial servants, tells them off for duty, inspects the latrines, trenching-ground, water-tanks, etc., daily supervises the morning and evening roll-call of all quarantined persons, keeps a daily register, giving the names of all admissions, the camp and the number of the hut in which they have been placed, the date on which their clothes were disinfected, and how the suspects were finally disposed of. He also brings before the medical officer in charge each morning the persons who are to be discharged that day for a final examination by that officer, and finally hands them over after discharge with their baggage and tickets duly countersigned to the Inspector of Police for escort to the railway station. He is also in charge of all stores and equipments and their issue, and brings

* Native bedstead.

to the notice of the medical officer persons who are destitute and have to be fed at Government expense. He keeps a daily report book for the information of the medical officer in charge. The medical officer in charge being on inspection duty every other night and part of each day has to rely greatly on the Assistant Surgeon in looking after the camp. He, however, personally each morning, having given orders the previous evening, examines all suspects paraded for discharge, and, after satisfying himself as to their health, countersigns their railway tickets which have been filed in the office at the time of admission. Subsequently he inspects the camp in company with the Assistant Surgeon and hospital assistant, and sees all quarantined persons, listens to complaints, etc., etc. At the time of his parade all suspects are summoned by a gong and stand in front of their huts. To facilitate these orders being carried out by persons unaccustomed to discipline, the *bunniah's** shop is closed during this parade and opened again immediately after it."

Separate hours were fixed for the occupants of the contact and suspect camps to obtain their supplies at the shop which was erected between the two camps. With a view to keeping the camps as dry as possible, suspects were not supplied with bathing-water, but were permitted to bathe in the large tank at two separate bathing-places, constables being stationed at each place to prevent any water being carried away for cooking or drinking purposes.

**Police force.**

The police force on duty consisted of—

1 European Inspector of the Bengal Police,
2 Sergeants of the Railway Police,
2 Constables of the Railway Police,
11 Head constables of the Bengal Police,
72 Constables of the Bengal Police.

Of these, 2 sergeants, 4 head constables, and 18 constables were employed on platform duty in two batches, 3 head constables and 24 constables were employed on sanitary duty in camp, and the remainder on miscellaneous duty.

**General rules for observation camps in Bengal.**

Dr. Dyson also prepared a set of general rules to be observed by medical officers in charge of observation camps with prescribed arrangements similar to those in force at Khana (Appendix VIII).

**Total Staff.**

The total medical staff employed on inspection duty in Bengal consisted of 4 commissioned officers and 2 military assistant surgeons, 5 civil hospital assistants and 4 lady doctors.

* Retail vendor.

**Rules issued by other Local Governments.**

Rules for the inspection of railway traffic were also issued by the Government of Madras, the Chief Commissioner of the Central Provinces, the Residents in Hyderabad and Mysore, and the Agents to the Governor General in Rajputana, Central India, and Baluchistan. These rules do not require examination in detail. The regulations prescribed by the Government of Madras require, amongst other matters, that any person who has been in an infected locality within the previous ten days, and is unable to satisfy the inspecting officer that he is proceeding to a fixed place of residence, shall be detained for ten days in segregation.

**Hospital accommodation and medical staff.**

In Madras hospital accommodation was provided at the inspection stations of Guntakal, Podanur, Arkonam, Kondapali, and Tuticorin. The medical staff detailed for plague duty consisted of 3 commissioned medical officers, 3 assistant surgeons, 2 civil apothecaries, and 15 hospital assistants. Midwives were employed as female inspectors at five principal inspection stations. In the Central Provinces special temporary plague hospitals were maintained at Nagpur and Itarsi, and hospital accommodation for plague patients at Jubbulpur and Bilaspur. The plague medical staff consisted of 2 commissioned medical officers, 4 assistant surgeons, 4 hospital assistants, and 1 female hospital assistant at both Nagpur and Itarsi. In the Central India Agency hospital accommodation was provided at Sutna, Indore, Rutlam and Ujjain. In addition to the medical staff transferred from Manikpur to Sutna the plague staff comprised 2 commissioned officers, 2 medical officers of the State, and 5 hospital assistants. Nurses were posted at Sutna and Rutlam. In Rajputana temporary plague hospitals were established at twelve places. At Ajmere and Bandikui there were European medical officers and female assistants, and there were native subordinates at other places. In Mysore hospital arrangements were made in the city and at the inspection stations, and female hospital assistants were employed at Bangalore, Harihar, and Yesvantpur. In the Hyderabad State temporary plague hospitals with doctors in attendance were established at the various inspection stations; and female doctors were posted to Wadi and Gulburga. The arrangements in Baluchistan have already been described.

**Prevention of the evasion of inspection.**

Where circumstances favoured such a course, passengers sometimes endeavoured to evade inspection, and various measures were adopted by the Local Governments to prevent their efforts from succeeding. It

**Sind.**

has already been noticed that the Commissioner in Sind caused booking to be closed at the stations in the immediate neighbourhood of Rohri in order to prevent passengers desiring to avoid inspection

starting their journey at a neighbouring station, and that the Agent to the Governor General in Baluchistan was obliged to prevent travellers alighting at the desert stations near the Punjab border in order to evade observation at Sharigh or Sibi. Similarly, booking to the stations immediately on either side of Shikarpur was prohibited in order to prevent evasion of the Shikarpur inspection, and booking to Tando-Thoro, a small station, distant two miles from Hyderabad in Sind, was prohibited in order to prevent evasion of inspection at this latter place. To prevent evasion of inspection at the important station of Khanpur, the Government of the Punjab instituted a system of moveable inspections. Attention was drawn to the fact that some passengers evaded the inspection at Khanpur by alighting at other stations and walking across country to rejoin the railway at some place beyond. Arrangements were therefore made under which the inspecting medical officer varied the place of inspection from day to day. Ten stations, situated above or below Khanpur, were appointed inspection stations; and in the event of cases being discovered in the course of the inspection at any of these places, the suspects were to be sent for treatment and observation either to Khanpur or to Sher Shah. The rules issued by the Government of Madras provide that, if a passenger from an infected district appears to be attempting to evade inspection by alighting at a station short of that for which his ticket is taken, he shall be obliged to continue his journey as far as the next inspection station. The Bengal Regulations of November 1897 contain the following rule:—

Baluchistan. Shikarpur. Khanpur. Madras. Bengal.

"In the event of a traveller from an infected area alighting at an intermediate station with the object of obtaining a fresh ticket, so as to conceal the fact that he comes from an infected area, the railway police will take down his name and the number of the fresh ticket issued, and will send information down the line, so that he may, on alighting, be placed under observation."

Minor matters on which orders were issued by the Government of India were the proper lighting of inspection stations, and the notification to the inspecting officers of the carrying of passengers by goods trains.

Lighting of stations, and travellers by goods trains.

The result of the carefully devised scheme of inspection which has now been described proved the efficacy of the arrangements. Leaving aside the outbreaks at Khandraoni and Hardwar and the cases that infected these places, only 67 cases of plague escaped across the Bombay and Sind frontier during the first period of the epidemic, of these 57 were detected at inspection stations along the railway routes. Thus, so far as is known, only 10 cases of plague were introduced

Results.

from the Bombay Presidency and Sind into the rest of India and passed undetected through the line of inspection station.* These 10 cases occurred in the following localities in the North-Western Provinces and the Punjab :—

*North-Western Provinces.*

| | |
|---|---|
| Bareilly ... ... ... ... ... | 1 |
| Rai Bareilly ... ... ... ... | 1 |
| Unao ... ... ... ... ... | 1 |
| Lucknow ... ... ... ... ... | 2 |
| Cawnpore ... ... ... ... ... | 1 |

*Punjab.*

| | |
|---|---|
| Rawalpindi district ... ... ... ... | 2 |
| Sialkot ... ... ... ... ... | 2 |

No case, detected on the railway or undetected, is known to have passed into Bengal *viâ* the North-Western Provinces, the Central Provinces, or Madras. Having in view the rigorous system of observing the suspicious enforced at the Khana inspection station, it is unlikely that a single case of plague has arrived as far as that station along the main route from Bombay.

## Surveillance of Travellers.

**Orders issued by the Government of India.**

After consulting the Local Governments and Administrations principally concerned, the Government of India issued a resolution in the Public Works Department, dated the 6th March, prescribing measures to facilitate the surveillance of travellers arriving by railway from infected districts by action in co-operation with railway administrations. It was stated in this resolution that the Government of India desired that all passengers from stations within the limits of the infected area should, on arrival at stations outside these limits, and at which no staff had been posted for the inspection of travellers, be required by the railway staff to furnish to the police, or other agency designated by the Local Government, their names and addresses, and such other particulars as might be required for the maintenance of a check on their proceedings and movements. Railway administrations were informed that the Government of India looked to them to give

**Registration of names, addresses, etc., of passengers for communication to local authorities.**

**Functions of the railway staff.**

* During the recrudescence a few more cases of plague have been carried beyond the borders of the Bombay Presidency. Three of these cases occurred in the Madras Presidency—one of them at Madras itself. Almost all were detected at the inspection stations. In October 1897 a small outbreak of plague was reported from a village in the Jullunder District of the Punjab and has since spread to some neighbouring villages. It is not known whence the infection was derived. Some villages in the Sirohi State of Rajputana, on the borders of the Palanpur State, and some villages in the Naldrug District of the Hyderabad State, on the borders of the Sholapur District of the Bombay Presidency, have also become infected. In the latter case the infection was probably carried by road.

all the assistance in their power to facilitate the arrangements made by the Local Governments ; but it was recognised that the time of the station staff was ordinarily too fully occupied with railway duties to admit of their undertaking any specific responsibilities beyond stopping the passengers, and thus giving an opportunity for making the necessary enquiries. It was, however, suggested that at smaller stations the railway staff might, in the absence of any special agency, record the names and addresses of passengers coming from the infected area, and forward the names and addresses, and any particulars of importance (such as attempts to evade inspections by re-booking), to the next inspection station, or to any authority designated by the Local Government. It was also suggested to the Local Governments that they should arrange to procure the necessary particulars at stations where an inspection staff was employed. A list of the railway stations within infected limits was circulated to Local Governments and Administrations and revised from time to time as the area of infection widened.

Rules made by Local Governments.

Some of the Local Governments and Administrations made additions to their railway inspection rules with a view to utilize the arrangements made for co-operation with the railway administrations.

Central Provinces.

The most complete rules on the subject were issued in the Central Provinces. In a notification, dated the 18th March, the Chief Commissioner directed that all travellers arriving by rail from stations within the infected area should be kept under surveillance until the ten days' period of incubation had expired. Lists of the infected stations were supplied to the railway officials. The railway police at all stations were directed to take down the names and addresses of passengers alighting from stations entered in the list, with particulars of the places whither they were bound and the length of time they meant to stay there. To enable these particulars to be recorded, a railway police officer accompanied the inspecting medical officer at places where individual medical inspection was made. At other stations the railway staff were directed to assist the police officer to take down the particulars, either in the course of collecting the tickets, or by checking the exit of passengers, or otherwise as might be found convenient. The railway police officer was directed to communicate the particulars to the Civil Surgeon of the district and to the District Superintendent of Police. The latter sent information to the officer in charge of the police station within whose jurisdiction the destination of the traveller was situated. The officer in charge of the police station was directed to satisfy himself by enquiry of the state of the traveller's health for a period of ten days after his arrival, and in the case of the traveller falling ill to take

action in accordance with the general plague regulations of the province.

**Rules issued by the Government of Bombay.**

The rule issued by the Government of Bombay was to the following effect:—

"Railway station masters shall require all passengers coming from infected stations to give names and addresses, business which has brought them to the station and intentions regarding future movements. * * * * A station master shall forward a copy of his list containing the above information every day to the nearest *mamlatdar*,* who shall forthwith instruct the headman of the town or village or the secretary of the municipality to watch such person and send a report if he is ill or departs within ten days."

**Arrangements in the Sholapur district.**

The following description given by the Collector of Sholapur of the arrangements enforced at the railway stations in his district is an instance of the manner in which the rules were worked in the Bombay Presidency:—

"A *karkun*† is posted (at the railway station) who takes the names and destinations of all passengers alighting from Dhond and stations beyond, a *dakhila* (pass), containing his name and place from where he has come, is then given to the passenger with orders to present it to the *patil*‡ of the village to which he is going immediately on arrival. At the same time the karkun despatches by post a post-card to the patil containing the same information. The patil is ordered to keep such arrivals under special observation for eight days. At the end of each week the patil submits to the mamlatdar a statement showing the results of such observation, which is compared with the statement received from the station clerk."

**Arrangements in the North-Western Provinces.**

The Government of the North-Western Provinces caused particulars to be recorded only at the stations where a medical inspection staff was posted. It was said by that Government that the plan was not found to work well and that it would not therefore be extended.

**Bengal.**

The Government of Bengal issued orders that at Chapra (Bengal and North-Western Railway), Chakardharpur (Bengal-Nagpur Railway), and Dinapore (East Indian Railway), the stations where tickets are checked, the railway police should take down the names, addresses, and destination of any person holding a ticket from any one of the infected stations, and should report these particulars to the District Superintendent of Police of the districts for which the passengers were bound. These arrangements were largely extended in the regulation issued by the Government of Bengal in November 1897. Two

* Executive officer of the Government.

† Clerical officer.

‡ Village headman.

or more village policemen are stationed at every railway station. On the arrival of the train the railway police prepare lists containing the names and residences of travellers from the infected area who alight, these lists, after being checked from the tickets collected are forwarded to the police station. When there is reason to suspect that a traveller has given either a wrong name or a wrong address, one of the village policemen is sent with him to verify the information given.

General regulations for the surveillance of travellers from infected localities enforced in the North-Western Provinces, the Punjab and the Central Provinces.

The Governments of the North-Western Provinces, the Punjab, and the Central Provinces issued a series of rules for the general observation of the health of the country and the special surveillance of towns and villages, the inhabitants of which were known to be in communication with Bombay, and of arrivals from Bombay. In issuing these rules the Government of the North-Western Provinces remarked (February 12th) that it was known that there was considerable intercourse between some districts of those Provinces and the Presidency of Bombay; for instance, many weavers had taken employment in the Bombay direction. With the large exodus that was taking place from Bombay it was apprehended that many natives of the country would return, and it was recognised that the surveillance of the health of these emigrants and the adoption of prompt measures should plague occur amongst them had become a matter of urgent necessity. Orders were accordingly issued under the Epidemic Diseases Act that in every district a list should be prepared of villages known to be directly connected, by trade relations or otherwise, with those parts of India in which bubonic plague was prevalent. To such villages the rules relating to the reporting of deaths where cholera is epidemic were applied, that is to say, daily reports of all deaths were submitted. At the same time a register was prepared in each police station, from reports furnished by village policemen, of all persons who returned from the Bombay Presidency, or who had arrived from that Presidency since the beginning of January. The information collected at the railway station was also utilised in the preparation of these lists. On receiving information of the death of any person whose name was recorded on the register or who resided in any village from which daily reports were submitted, or on finding that an unusually large number of deaths were reported from any village in his circle, the officer in charge of the police station was required to enquire into the symptoms which preceded death. If the circumstance gave rise to a suspicion of plague, the officer was required to go to the village, to report to his superiors, and to see to the adoption of the precautionary measures prescribed by the general plague

Lists maintained at the police station of villages in communication with Bombay (List A).

Daily reports of deaths in these villages.

Lists maintained in police stations of arrivals from the Bombay Presidency (List B).

Enquiry on receipt of information of death of any person entered in list B, or residing in a village entered in list A, or of unusual mortality in any village.

regulations of the province. The rules issued by the Government of the Punjab and the Chief Commissioner of the Central Provinces followed those enforced in the North-Western Provinces and Oudh.

The regulations issued by the Government of Bengal in November 1897 prescribed similar arrangements modified to some extent to meet the different circumstances of Bengal Administration. In Bengal the nominal list is prepared from information supplied by the village policemen and from the information collected at the railway stations.

## Disinfection of Clothing and Baggage.

**Importance of this subject.**

As infection may be spread by the contaminated clothes and personal effects of passengers, it was recognised that the disinfection of suspicious articles was a necessary adjunct to the medical inspection which was made at different stations along the lines of communication from the infected districts. At a number of the principal inspection stations, both within and without the Bombay Presidency, special arrangements were made for the disinfection of all suspicious baggage, and the rules framed by the Local Governments and Administrations provided specially for the disinfection or destruction of such articles.

**Special arrangements at principal inspection stations.**

**Rules framed by Local Governments.**

The following rule promulgated by the Government of the North-Western Provinces and Oudh is similar to that enforced in other provinces:—

"If necessary, the medical officer shall himself arrange for the disinfection or destruction of clothes, etc. In cases where it is considered necessary that the clothes, or bedding, etc., of a traveller shall be burnt, the medical officer may, if the person is poor or for other sufficient reason, arrange for providing other articles in their place at the expense of Government."

**Instructions issued by the Government of India for disinfection of baggage near the Bombay frontier.**

On the 28th February and again on the 15th March the Government of India addressed the Government of Bombay on the subject of the disinfection of the suspicious baggage of travellers before they were permitted to cross the borders of the province. It was stated that the Government of India considered that the disinfection should be performed at a railway station near the frontier of the Bombay Presidency and Sind on each of the railway lines leading from those provinces to other parts of India, and that the medical officers at places where the disinfection took place should be instructed to exercise the widest discretion so as to render it impossible that articles which might be contaminated should be passed without being disinfected. Disinfection was not prescribed in the case of

the personal effects of persons who were not themselves suspected to be infected, unless the effects were in such a condition, through their dirt or otherwise, as to raise a suspicion that they might be contaminated. Disinfection by steam was recognised to be the most satisfactory method, but until arrangements could be made to carry out this process, the following instructions were prescribed on the advice of the Sanitary Commissioner with the Government of India :— Method of disinfection.

"(1) All articles which the medical officers consider to be infected or suspicious, subject to the exceptions noted in clauses (2), (3) and (4), should be boiled for ten minutes in a solution of carbolic acid (1—40). The temperature of the solution will of course be temporarily lowered by each article that is plunged into it, so that precaution is necessary, not only to see that each article is so unfolded as to be exposed in every part, but that every part is subjected to the boiling temperature for the full ten minutes. On removal from the boiler, articles should be dried in the sun for at least an hour.

"(2) Articles made of leather or wood and glue, etc., which would be injured by boiling, should be soaked in, or thoroughly mopped with a solution of perchloride of mercury and dried in the sun. When it is considered necessary, such articles may, in addition, be washed with a warm 5 per cent. solution of carbolic acid and soft soap.

"(3) Metallic articles, which may be unsuited to treatment by boiling, should be washed and scrubbed with a warm 5 per cent. solution of carbolic acid and soft soap and dried in the sun.

"(4) Articles capable of conveying infection, which cannot be treated in any of these ways, should be burnt."

Subsequently the Government of Bombay indented for three small Geneste-Herscher steam disinfecting apparati from England.

On receiving the instructions detailed above, the Government of Bombay issued orders for the disinfection of travellers' clothing, etc., at the Hotgi, Bhusawal, and Ruk stations. Amongst numerous other inspection stations at which special arrangements were made for the disinfection of clothing the following may be mentioned :— Ahmedabad, Khanpur, Sharigh, Sutna, and Khana junction. Orders of the Bombay Government for disinfection at Hotgi, Bhusawal, and Ruk.

Lieutenant J. G. Crosthwaite, Assistant Commissioner, and Surgeon-Lieutenant Milne, submitted interesting reports on the arrangements carried out under their superintendence at the disinfection and inspection station at Khanpur. All passengers from Sind were examined and the suspicious were detained under observation, and the disinfection of baggage was carried out on a large scale. Two Arrangements for disinfection and segregation at Khanpur. General account of the arrangements.

daily trains arrived at Khanpur from the direction of Sind—one at 7-11 A.M. and the other at 6-20 P.M. Whilst the disinfecting operations were in progress the passengers were detained in lines erected for the purpose. The persons arriving by the evening train of one day and by the morning train of the following day were all despatched, the disinfection being then completed, by the evening train of that day. Those persons only who were considered suspicious were detained for a longer time.*

Examination of passengers and removal to the lines.

Lieutenant Crosthwaite gave the following account of the arrangements for detaining the passengers and removing them to the lines:—

"On the arrival of the evening train the inspecting medical officer and disinfecting officer see each carriage. The former examines all first and second class passengers. Any to be detained are locked into their carriages. The camp clerks then enter up the numbers of tickets and passengers' names and parentage: those of the women are entered up in a separate slip by the female hospital assistant, which is afterwards copied into the camp registers. One third class compartment is reserved for railway servants on duty, fuel contractors, state excise contractors, post office officials, and others travelling locally on duty. These men's passes are examined and they are let out. The outgoing train stands on line No. 2 and in this are the disinfected passengers. Two constables are placed between the two trains to prevent any one slipping out of the incoming train. On the completion of the inspecting medical officer's examination the whole train is taken out to No. 5 line the first and second class passengers and contents of brake and postal van having been previously transferred, though the use of this latter step is not very apparent, so long as neither postal officials' bags, nor contents of brake van, are disinfected. The camp clerks, hospital assistant and all police on duty accompanied the train to No. 5 line. On its arrival there the remaining passengers were entered in the register, and the male passengers conducted to the detention lines by the disinfecting officer and quartered. The women were taken by a separate route to the women's lines by the female hospital assistant and the dhái. The camp water-carriers attended to carry the women's baggage, etc.

"On the withdrawal of the incoming train the outgoing train was brought on to the platform and was generally despatched before the incoming passengers were clear of their train. This was a distinct advantage, as the passengers quickly resigned themselves to their stay in the lines, when they found the other train had already left."

* The arrangements are illustrated by the map in Volume IV, page 18.

The camp was capable of accommodating 375 men and 40 women and children. The men and women were lodged in separate lines divided by an embankment; there was also a third set of intermediate or family quarters. The lines consisted of rows of cubicles ingeniously constructed of unserviceable sleepers. Each cubicle was 10′ 9″ by 8′ 6″ in area, with a roof 8′ 6″ in height at the back, sloping down to 7′ 6″ in front. The sleeper huts were found to be more serviceable and less expensive than huts made of grass. They were disinfected once a month with a solution of corrosive sublimate. **The camp.**

The sanitation of the lines and the food supply and comfort of the occupants were carefully arranged. A staff of policemen and of soldiers of the Bahawalpur State executed the necessary guard and patrol duties. The establishment under the Assistant Commissioner and Medical Officer consisted of one hospital assistant, one female hospital assistant, and camp servants for the men's and women's lines.

Tanks were used for the disinfection of clothing by steam heated to about 225° to 230° Fahrenheit under a pressure of 6 lbs. A simply constructed furnace was used for the destruction of condemned baggage. **Disinfecting arrangements.**

The following account of the disinfecting arrangements is from Lieutenant Crosthwaite's report :—

"(*a*) At sunrise the camp hospital assistant saw that all kits belonging to men, passengers of the mail train on the previous evening, were opened up and laid in the sun.

"(*b*) At 8 A.M. the passengers by the 23 up mixed having been escorted to the lines and their clothes laid out, I inspected all their kits, selecting clothing, etc., to be steamed, sun disinfected, or destroyed. As each passenger's property was inspected, he was ordered to take the clothes to be steamed at the tanks; clothes to be sunned were placed on the cell roofs or on charpais; clothing to be destroyed was handed over to the sweeper.

"(*c*) On arrival at the tanks the clothes were laid lengthways and tied in the middle, not rolled up in a cloth. A brass number was attached to the clothes and the duplicate retained by the passenger. Companions frequently made one bundle of all their clothes. Before leaving their clothes each passenger was supplied, if he desired it, with a 'langochá'* or waist-cloth. The passenger next bathed either in the tank or under the engine hydrant as taste or caste advised. He then returned to the lines to await inspection.

* *Note by Lieutenant Crosthwaite.*—If these arrangements were continued in the cold weather, blankets, coats and trousers would become a necessity. 'Langochás' can only be considered a hot weather arrangement.

"(*d*) Though under the instructions of the Plague Conference clothes were supposed to be provided, yet in practice no other clothes beyond 'langochás' were ordinarily supplied or asked for. Most passengers had spare clothes, but many preferred to remain in the 'langochá' only until after inspection. Men of the better class sometimes asked for clothes, and these were at once supplied from the store. The 'langochás' were washed daily and frequently disinfected."

**Compensation.**

Compensation either in the form of new garments, etc., or in cash was given to all persons any part of whose baggage was destroyed. In all 2,357 articles of clothing, bedding, etc., were destroyed, 1,298 were replaced by new articles, and Rs. 189-13-0 was paid in compensation for the remainder.

**Inspection of passengers and observation of the suspicious.**

Surgeon-Lieutenant Milne gave the following account of the arrangements for the inspection of passengers and the observation of suspicious persons:—

"All trains coming here from Karachi were inspected on arrival. Obviously sick persons were removed to the hospital at once, and the remainder of the third and intermediate passengers were carefully observed as they passed from the train.

"First and second class passengers were invariably examined on the platform and passed, unless their condition or the state of their clothing were absolutely prohibitive. The persons booking from Khanpur were similarly inspected.

"Every day at 9 A.M., after all clothes had been handed in for disinfection and every person had bathed, a thorough inspection of every person took place. Many cases of slight fever, especially in the earlier days, were detected, and these were either detained in special huts built for the purpose, or, if considered necessary, were taken to the hospital. When a passenger had thus been disinfected, bathed and passed he had Khanpur stamped on the back of his ticket.

"At 5 P.M. the passengers from the preceding mail and mixed trains were let off, each person being observed as he left, and his ticket examined for the stamp note in order to assure us that the conditions of his detention had been fulfilled.

**Statistics.**

"From April 8th to July 8th, 13,876 persons had been detained, etc. In addition to this I inspected about 5,794 others on the platform, making a grand total of 19,670 inspected during that time.

"Out of that number it was found necessary to admit into hospital under observation as suspicious 19 persons. Nine of these were actually sick, the remaining ten being their companions.

"The nine cases are certified in the admission and discharge book of the hospital as follows:— Cases of sickness.

| | |
|---|---|
| Remittent fever ... ... ... ... ... | 4 |
| Malarial cachexia ... ... ... ... ... | 1 |
| Bronchitis ... ... ... ... ... | 1 |
| Tubercle of lung ... ... ... ... ... | 2 |
| Heat apoplexy ... ... ... ... ... | 1 |
| TOTAL ... | 9 |

"All of these recovered with the exception of one of the cases of tubercle of the lung admitted into hospital in a moribund condition on the 4th July and who succumbed on the 6th.

"No case of actual plague was detected during the period. The last case which affords grounds for the suspicion that it was a case of so-called pneumonic form of bubonic plague (so ably described by Childe and others, the reading of whose experiences bias me in this opinion) was a man who died on the 9th April and who was admitted with symptoms of fever and bronchitis on the 7th. No case of plague detected.

"Every case admitted into hospital was treated with the same precautions which would have been observed in undoubted cases of bubonic plague."

Special arrangements were made to secure the privacy of women, and every consideration was shown to their feelings. The women's line was in charge of female hospital assistant, Hydari Begum, who carried out her duties with great care and tact. Women were in general examined in the camp and not on the platform. Separate arrangements were made for the disinfection of their clothes, their messing, etc. Their camp was looked after by female servants, and practically the commissioned medical officer was the only man that used to enter it. Female passengers.

## Disinfection of Railway Carriages.

There are permanent rules in force on the lines of the different railway companies with regard to the disinfection of carriages in which cases of infectious disease have occurred, but these regulations were found to be insufficient to meet the emergency. On the 21st of April the Government of India issued a set of instructions for the disinfection of railway carriages which were to take effect over the lines of all railway administrations. The instructions provided for two classes of cases: (*a*) the disinfection of carriages in which a case of plague Permanent rules in force on railway lines. General instructions issued by the Government of India.

had been detected, and (*b*) the disinfection of carriages coming from the infected area in which no case of plague had been detected.

**Disinfection of carriages in which plague cases are detected.**

In the case of carriages in which cases of plague had been detected, it was ordered that the vehicle should be stopped either at the station where the plague case was removed or at the nearest medical inspection station, preferably the former if there were means for the prompt and thorough execution of the disinfecting process. The following was the process prescribed:—

"(*i*) The vehicles, after being detached from the train, should be thoroughly washed with soft soap and lime-water. After an interval of two to three hours this should be washed off with plain water, and then the following disinfecting solution should be thoroughly sprayed all over the interior as well as the exterior of the carriages by means of a syringe:—

| | | | |
|---|---|---|---|
| Corrosive sublimate | ... | ... | ½ oz. |
| Hydrochloric acid | ... | ... | 1 „ |
| Water ... | ... | ... | 3 gallons. |

"This solution should be allowed to dry on the carriages. Special care must be taken to direct the solution into all the cracks and crevices and *jilmills*.*

"(*ii*) After disinfection the carriages should be kept out in the open for 48 hours. They can then be brought into use again.

"(*iii*) In the case of first and second class carriages, which afford greater facilities than third class compartments for the harbouring of plague germs, it will be necessary, if the carriages are contaminated, to burn the cushions and to disinfect the woodwork in the manner indicated above, and repaint the interior.

"(*iv*) Any compartment in which a suspicious case has travelled should be sprayed with the above disinfecting solution before being allowed to proceed."

**Disinfection of non-suspect vehicles from the infected area.**

In the case of non-suspect vehicles the instructions stated that the carriages should be disinfected at the medical inspection station nearest to the boundary of the infected area in accordance with the following method:—

"*Third and intermediate class carriages, goods vehicles carrying passengers and luggage vans.*—The interior woodwork, especially

* Window blinds.

the floors and seats, to be thoroughly washed with a solution of perchloride of mercury (1 in 1,000), or with a carbolic acid solution (a wine glass full to a gallon) applied with a mop; the doors and windows to be opened and the vehicles exposed to the air.

"*First and second class carriages.*—The floors and woodwork to be treated as above, the cushions being also brushed and thoroughly cleaned."

Instructions not fully carried out on the Great Indian Peninsula Railway.

The Government of Bombay reported on the 22nd of May that the instructions regarding non-suspect vehicles had not been carried out in full on the lines of Great Indian Peninsula Railway, and that to do this would occasion considerable inconvenience and delay. They suggested that it would be sufficient if non-suspect carriages were disinfected at the end of the journey instead of at an inspection station on the boundary of the infected area. By this time the virulence of the epidemic had greatly diminished, and the Government of India consented to the proposed relaxation of the orders. At the same time they stated that should there be a recrudescence of the plague the rules of the 21st May must be enforced in their entirety. At the time of the recrudescence the matter was reconsidered and it was determined that it was not necessary to modify the existing arrangements.

Relaxation of the rules for non-suspect carriages.

## Measures to prevent the spread of infection by road and river.

Precautions adopted in the Bombay Presidency and on the Sind border.

The precautions taken to prevent the spread of plague by passengers travelling by railway from the infected parts of the Bombay Presidency to other parts of India having been described, there remains for description the precautions adopted to prevent the spread of plague by other means of communication from one part of the Presidency to another, and across the Sind border into the Punjab.

### MEASURES ADOPTED IN THE BOMBAY PRESIDENCY.

Subject already noticed in discussing land quarantine.

Some notice has already been taken of the measures enforced in the Bombay Presidency in discussing the subject of land quarantine.

**General rule issued by the Government of Bombay for the control of intercourse between infected and healthy localities.**

It will be remembered that Rule 29 of the general Bombay plague regulation gives the Commissioner of the division discretionary power to authorise plague authorities, appointed for the purpose, to prevent the passage of suspicious persons away from infected localities or into other localities, until they had been detained under observation, and their clothing, etc., had been disinfected. These plague authorities were allowed a wide discretion to decide what persons should be regarded as "suspicious."

**Other general rules issued by the Government of Bombay.**

The following is the substance of other rules on the same subject contained in the general plague regulations issued by the Government of Bombay:—

**Inspection of persons coming from infected areas.**

*Rule 4.*—Plague authorities are authorised to inspect persons coming from infected areas, and to detain suspicious subjects at places appointed for the purpose.

**Establishment of observation posts on roads.**

*Rule 5.*—Authority is given to District Magistrates to establish observation posts on roads leading from infected localities to other places. The officers appointed to the posts are empowered to detain for examination any person whom they suspect to be suffering from plague, and are directed, if not themselves medical officers, to give information to the nearest medical officer authorised to take action under the rule.

**Rule to secure the co-operation of villagers.**

*Rule 25.*—This rule was designed to secure the co-operation of the villagers in preventing the spread of plague to their villages. The village headman is directed to prevent the entrance into his village site of any person believed by him to be suffering from plague, and if any such person is found within the precincts of the village to send him in a cart or litter to the nearest isolation hospital, or if this be too far, to at once build or allot a hut for him outside the village site and detain him there until the orders of the executive officer can be procured. The rule further directs that the companions of any person suspected to be suffering from plague should not be allowed to enter the village site, but should be required to accommodate themselves outside the village during the period of their detention, reasonable assistance being given to them for this purpose.

**Instance illustrating the working of the rules.**

The following account of the precautions taken for the protection of the hill station of Mahableshwar will illustrate the manner in which these rules were worked.

**Arrangements to protect Mahableshwar.**

Mahableshwar is a hill station and sanitarium in the Satara District, and is during the hot weather months the seat of the Local

Government. It is situated on the Mahableshwar range of hills with a general elevation of from 4,500 to 4,700 feet above the sea-level. The regulations framed for the protection of Mahableshwar and the neighbouring hill station of Panchgani, and a report on the arrangements at Mahableshwar are reprinted in Appendix VIII. The regulations were issued on the 6th April in supersession of a previous set of rules. The Government of India took exception to a clause contained in the rules requiring the quarantine of all persons, except those belonging to certain specified classes. They stated that the detention of persons likely to carry infection should be secured by giving a wide discretion to the inspecting medical officer; and that though the operation of this measure and of the measures prescribed by the Mahableshwar rules would probably give much the same results, the proper and fair way to secure these results was by the exercise of the discretion of the inspecting officer, and not by treating as suspicious persons, except those belonging to certain exempted classes. The use of the word "quarantine," the meaning of which is the detention of all persons absolutely or for a specified period (originally forty days), is also inadmissible in describing arrangements to secure the observation of travellers, and the segregation of, and the adoption of other precautionary measures towards, persons likely to carry the seeds of infection.

**Rules issued by the Government of Bombay.**

**Objection to the form of the detention rule.**

**Use of the word "quarantine."**

The report on the measures carried out at Mahableshwar was written on the 8th June by Mr. Alexander, Superintendent of Police, who was in charge of the operations. He took over charge on the 1st March and his duties terminated on the 29th May. The station was surrounded by a series of posts established on the different approaches to the place. There were five main posts on the principal roads of approach and several subsidiary posts. The posts were in charge of a police force consisting of 4 jemadars (police sergeants), 3 naiks (subordinate police officers), and 32 constables.

**Mr. Alexander's report on the operations.**

**Series of observation posts.**

At the protective posts travellers were either permitted to pass on, or were stopped for detention under medical surveillance in an observation camp. In the camp which Mr. Alexander considered the best equipped, the inhabitants were housed in huts divided from one another by a considerable space. If a plague case occurred in one of these huts, it could be burnt down. In all about 870 persons were detained under observation in the different camps. It was found that the public resorted to many contrivances to prevent their detention under observation. All doubtful cases were reported to Mr. Alexander. In all cases in which the precaution was considered necessary persons permitted to pass into Mahableshwar without

**Inspection and detention of travellers.**

**Observation camp.**

**Medical surveillance of**

**persons allowed to enter the station.**

previous detention were kept under medical surveillance until the ten days' incubation period had expired, and for this purpose they were required to attend daily at the hospital. The preventive posts submitted daily reports to Mr. Alexander showing who had arrived during the day and how they had been disposed of. From these daily reports a register was prepared in which was recorded the name of every person entering Mahableshwar, his residence, the place he came from, the date on which he left that place, the date of his arrival, and the date up to which he had to present himself at hospital. In this register the attendance at hospital was every day marked off, and Mr. Alexander was thus able to see at once what persons had failed to attend hospital and to take the necessary action to secure the enforcement of the medical surveillance. 2,200 persons attended the hospital for periods varying from one to eight days.

**Attendence at hospital.**

**Cart-drivers.**

Cart-drivers with carts were admitted straight into Mahableshwar, but were directed to move out as soon as they had completed their business. As an additional precaution all cartmen moving from the Konkan to the Satara district, and *vice versâ*, and who did not wish to stop at Mahableshwar, were escorted through the place and not allowed into the bazar. Travellers who did not wish to stop at Mahableshwar were escorted through in a like manner. Special precautions were taken to prevent the police from interfering with the villagers of the neighbourhood who bring daily supplies into the station.

**Carts and travellers passing through the station.**

**Villagers bringing in the daily food-supply.**

**Only one case of plague occurred.**

Only one case of plague occurred. The sufferer was a Hindu woman who had arrived from Poona and was undergoing the usual detention in one of the camps. She and her relatives and attendants were kept in the camp and all the other inhabitants, over 70 in number, were moved to a neighbouring camp where there was accommodation for them. Both camps were strictly segregated. The woman died and her body was burnt outside the camp. There was no spread of infection.

**Protection of Bombay against re-infection.**

General Gatacre gave the following account of the measures adopted to prevent the re-infection of Bombay by persons entering on foot :—

**Places of entry for foot passengers.**

"There are five ways by which people can enter Bombay Island on foot :—

(1) The Bandora or Mahim Causeway.

(2) The Coorla or Sion Causeway.

(3) The Great Indian Peninsula Railway Causeway.

(4) The Bombay, Baroda and Central India Railway Causeway.

(5) A tract of land lying between Coorla on the mainland and thevillage of Sion on the island of Bombay. This is sometimes flooded, but is generally fordable.

(6) A small railway line running along a bund beside the Tasua main water-pipe from Chimbur on the mainland to Sion.

Closure of four entries.

"These extend over a space of no less than five miles, and, as it would have been impossible to hold examinations at all these points without a very large staff, all the entrances were closed, with the exception of 1 and 2. A police guard was posted to prevent the public crossing by the railway causeways on foot; the ford was watched by a military guard, who turned back all the people who tried to go by that way and made them go by the Sion Causeway, and the line over the water main pipe was closed by keeping the swinging bridge always open.

System at the open causeways.

"The inspection actually began on March 24th. The causeways were closed from 7 P.M. to 6 A.M. by a military guard to all, except those who had obtained a special pass. On April 21st, 8 P.M., was fixed as the hour for closing the causeways; and finally on June 6th, the Sion Causeway was opened an hour earlier to suit the convenience of the market gardeners who have to bring their produce to the Bombay market at an early hour.

Mahim Causeway.

"On the Mahim Causeway the inspection was at first held on the Bombay side. Before the monsoon it was removed to the Bandora side. The staff consisted of two medical officers, assisted by the Mahim Sub-divisional Officer and nine police sepoys. As long as there was a hospital on the spot, the nurses used to do the work of examining the females. Since the hospital has been closed, Mrs. Sanders has been engaged for that work.

Sion Causeway.

"The examination of the Sion Causeway was held at the Sion end. The staff consisted of two medical officers and two medical students. Since the abolition of the hospital there, a lady doctor, Mrs. Beale, has been engaged for the examination of females.

Results.

"The number of cases detected was as under:—

| | Mahim. | Sion. |
|---|---|---|
| Suspicious cases ... ... ... | 36 | 16 |
| Plague cases ... ... ... | 13 | 11" |

## PROTECTION OF THE PUNJAB FRONTIER.

**Protection of the road and river routes into the Punjab. General regulations.**

The Government of the Punjab issued a special set of rules to protect the road and river routes leading from the direction of Sind. In the first place general orders were issued to the effect that (*a*) any ferry or any portion of a navigable steam, with the approaches, might be appointed to be a place of inspection to which the railway inspection rule should apply in so far as they were applicable; and (*b*) the public or any class of persons might be prohibited by Government notification from travelling to or from any local area, either absolutely or otherwise than by way of a specified place or places. These general regulations were applied to the case of the Sind frontier by a set of special notifications which appointed the village of Rojhan and the Mithankot ferry on the River Indus, both in the Dera Ghazi Khan district, to be places of inspection and which prohibited travellers from the direction of Sind and the Bahawalpur State from visiting any part of the Dera Ghazi Khan district otherwise than by way of the Rojhan observation post, the Mithankot observation post, or some public ferry higher up the stream than the ferry of Mithankot. The effect of the rules was to prevent any one travelling from the direction of Sind by road or river from entering the Punjab without being subjected to observation, and if necessary to detention. The arrangements are illustrated by the map at page 19 of Vol. IV.

**Observation posts at Rojhan and the Mithankot ferry. Route restrictions.**

## Pilgrimages in India.

**Special dangers of pilgrimages.**

Special anxiety was experienced lest the infection of plague should be spread by means of the pilgrimages and large religious or semi-religious assemblages which form a common incident of Indian life. The persons taking part in these pilgrimages and assemblages belong in many instances to classes whose habits and method of life render them peculiarly liable to infection, the collection of large bodies of such people in a more or less crowded space offers conditions very favourable to the spread of epidemic diseases, and should such disease break out amongst them they endanger all parts of the country to which they return.

**Orders of the Government of Bombay.**

The Government of Bombay and other Local Governments and Administrations issued special regulations to minimise this peril. Rule 20 of the general Bombay rules provided that the District Magistrate might, with the previous sanction of the Commissioner, prohibit either

wholly, or subject to such restrictions as he might impose, the holding of fairs, caste feasts, or other assemblages which were likely to assist the spread of the plague. A number of orders were issued under this Regulation, and the Government of Bombay also issued a separate order prohibiting for a time all pilgrimages and fairs in the Thana and Poona districts. In October 1897 a similar order was issued prohibiting the holding of a fair at Panharpur in the Sholapur district.

Prohibition of fairs in the Thana and Poona districts.

In another chapter the precautions taken by the Government of India and the Government of the North-Western Provinces and Oudh to prevent the spread of infection by visitors to the renowned place of pilgrimage at Hardwar have been described. In the Punjab orders issued forbidding all persons coming from the direction of Sind to visit Sakhi Sarwar in the Dera Ghazi Khan District, where there is a shrine which is a favourite resort of pilgrims.

Hardwar in the North-Western Provinces.

Sakhi Sarwar in the Punjab.

In the Puri district of Orissa in Bengal special precautions were taken at the time of the annual Car festival of Jagannath, a sacred festival which is attended by a large concourse of pilgrims from all parts of India. In travelling towards Puri the pilgrims from the Bombay Presidency (who are not as a rule numerous) had to pass a series of principal and minor inspection stations, and their condition was specially watched. At Khurda road, a principal inspection station, on the East Coast Railway, distant about 25 miles from Puri, a special observation camp was established and pilgrims from the Bombay side were detained there until the necessary precautions had been adopted, and there was no longer any danger of their spreading infection.

The Jagannath festival in Bengal.

A religious fair known as the Singhast Mela is held once in twelve years at Ujjain in the Native State of Gwalior, and is usually attended by three or four hundred thousand persons, chiefly religious mendicants from all parts of India. It happened that the period of this fair fell within the year 1897; it extended from the 17th April to the 16th May, the dates being those of the full moon in the Hindu months of Chaith and Baisakh. Arrangements were begun in the early months of the year 1896 to provide for the great influx of people expected at Ujjain; but, in October 1896, when famine threatened, the Maharaja of Gwalior issued orders prohibiting the fair, and notices were printed by His Highness' Government and forwarded to the Agent to the Governor General in Central India for wide circulation. Copies were sent by the Agent in November 1896 to all Local Governments and Administrations and to the authorities of all the railways in India, and a reminder was sent in

The Singhast Mela at Ujjain in Gwalior.

March 1897. On the 10th April 1897 Colonel Barr, the Agent, reported that notwithstanding these precautions about fifteen thousand religious mendicants had arrived from all parts of India, and that it was not possible to prevent them from going to Ujjain, notwithstanding the anxiety felt lest an epidemic, possibly of plague, should break out amongst the pilgrims. He therefore arranged in consultation with the local authorities and with the consent of His Highness that the pilgrims should bathe on the 17th April in the Sipra at Ujjain under strict rules with regard to encampment outside the city and sanitary arrangements, and under a promise to leave Ujjain on the following day. The spiritual heads of the different sects agreed to these arrangements and bound themselves to enforce obedience on their followers. Colonel Barr at the same time urged that, in view of the prevalence of plague in some of the districts whence the pilgrims had come, it was most important to prevent a further assemblage during the period intervening between the first and second bathing days. With this view the Government of India fully agreed, and on the 12th April a telegram was sent to all Local Governments and Administrations repeating Colonel Barr's observations, and stating that everything possible should be done to meet His Highness Maharaja Sindhia's desire to restrict the assemblage. The Government of India also issued, and gave wide circulation to, a notification under the Epidemic Diseases Act prohibiting, until the 1st May, the sale of tickets to travel by railway to Ujjain to all persons intending to visit the Singhast Mela. On the 23rd April, Colonel Barr reported that the pilgrims who were permitted to bathe at Ujjain had dispersed without any outbreak of disease occurring amongst them. About twenty-two thousand devotees were present at the bathing, and the arrangements for sanitation and control were carried out without difficulty.

**Prohibition against the sale of railway tickets to intending pilgrims for Ujjain.**

**Orders issued during the second period of the plague.**

During the second period of the plague epidemic the Government of India issued several Notifications under the Epidemic Diseases Act prohibiting the sale within the Bombay Presidency of tickets to travel by railway to the scene of different fairs held in various parts of India, to pilgrims and other persons intending, or believed to be intending, to go on pilgrimage to those fairs. A number of similar orders were issued in the Bombay Presidency.

## The Frontier.

**Adoption of precautions to prevent plague**

The Government of India recognised that it was incumbent upon them to cause every precaution to be taken to prevent plague

infection from crossing the frontier, and thence invading Baluchistan, Afghanistan, Persia, or Russia. The careful and successful precautions adopted to prevent the spread of plague from the Bombay Presidency and Sind into the North-Western Provinces, the Punjab, and Baluchistan afforded the surest protection to the trans-frontier countries, and in elaborating these precautions this matter was constantly borne in mind. The most direct line of invasion was from Sind *viâ* the Punjab or Baluchistan. The means adopted to prevent the spread of plague to these parts of the country have been described in this and previous chapters, but it will not be out of place to repeat here the summary of the Punjab measures given by the Government of that province in discussing the protection of the Central Asian countries.

spreading over the frontier. The precautions adopted in the Punjab, Baluchistan, and the North-Western Provinces afford the surest safeguard.

"The province is protected by a system of inspection at railway stations, ferries, and road posts, of the general character of which the Government of India are already aware. In addition to the inspection of travellers alighting from the trains at a large number of stations which include all district head-quarters and all cantonments on or near the line of railway and all termini for hill stations, there are special inspections, at which all passengers are examined at certain points which have been so selected as to enable the work to be done by daylight. Passengers from Sind are all inspected at Khanpur or at some neighbouring station, the actual place of inspection being varied from time to time to provide against the practice of evading inspection by marching across country. All intermediate and third class passengers are now detained for 24 hours at Khanpur, in order to undergo the disinfection of their clothes and personal effects, and an Assistant Commissioner has been placed on special duty there to superintend the arrangements. A second line of defence against the danger from Sind is provided by inspection of all passengers either at Sher Shah or at Raewind, all passengers for the Sind-Sagar line being inspected at the former place. Passengers from the Bombay direction by the Bombay, Baroda and Central India line undergo inspection either at Bhatinda or at Ferozepore according to the train by which they arrive, while those travelling by the East Indian Railway, after undergoing inspection at Ghaziabad in the North-Western Provinces, are again inspected either at the junction of Wazirabad or at Jhelum, according to the train by which they arrive.

Summary of the Punjab precautions.

"Passengers up the Indus from Sind are stopped at the ferry of Mithankot and there examined. Entry into the Dera Ghazi Khan

district from Sind or from the Native State of Bahawalpur, which lies on the opposite side of the Indus, is prohibited otherwise than by way of Mithankot or Rojhan,—a road inspection post situated at the extreme south of the district.

"A record is kept by the police of all arrivals from the infected provinces, and particular attention is paid to deaths occurring among such persons with a view to immediate detection of cases of plague. It has been made legally incumbent upon certain persons, including village officials, house-holders, and serai-keepers, to report at once all arrivals from infected provinces and all suspicious cases of disease. The District Magistrate and any 1st class Magistrate or Commissioned Medical Officer, to whom he may delegate the power, has legal authority to remove a plague patient to hospital, and to destroy or disinfect any building which he has occupied. Many minor matters have also been provided for by regulations issued under the Epidemic Diseases Act, 1897, and it is believed that such machinery as can be provided exists for the discovery and stamping out of the disease as soon as it shows itself."

**Protection of Afghanistan.**

With regard to Afghanistan the Lieutenant-Governor of the Punjab (Sir William Macworth Young) considered that so long as the Punjab remained free from plague, the protection of Afghanistan was as efficiently secured by the measures adopted on the east and south frontiers of the province as by any special arrangements on the north and west frontiers. The Lieutenant-Governor suggested that, if the Punjab or any part of it became infected, it might be necessary to establish an inspection cordon for the special protection of Afghanistan, but he considered that it would be best to await the development of events before deciding precisely the line of defence that should be adopted. In this view the Government of India concurred and fortunately the measures adopted were successful in protecting both the Punjab * and the countries lying beyond it.

**Protection of Baluchistan.**

For the protection of Baluchistan, in addition to the railway traffic inspection and the quarantine arrangements that have already been described, all roads leading across the border of the Shikarpur district in the north of Sind were carefully watched on both sides of the boundary, and the tribal levies of Las Bela prevented travellers from

* The outbreak of plague confined to a few villages of the Jullunder and Hoshiarpur Districts, the inmates of which were segregated in camps, which occurred during the second period of the plague did not make it necessary to reconsider this decision.

Karachi from crossing into Baluchistan. In Kashmir plague inspection posts were established at Jammu, the terminus of the railway, and at Ranbirsinghpura, Tawi, and Kohala. A letter was received by the Government of India from His Highness the Amir of Afghanistan expressing satisfaction with the completeness of the precautionary arrangements.

Inspection post in Kashmir.

Two cases of plague were detected and stopped at the principal Baluchistan inspection station, but so far as is known no other case, indigenous or infected, occurred in either Baluchistan or Afghanistan. From time to time rumours were heard of the existence of disease resembling plague in some part or other of Afghanistan, but these rumours in all cases turned out to be without foundation.

Success of the measures for the protection of the frontier.

Before leaving this portion of the subject the precautionary measures adopted in some of the countries lying beyond the border must be noticed.

Precautionary measures in countries beyond the border.

For the further protection of Kandahar it is stated that all persons coming from the direction of Baluchistan were detained for a certain number of days at some distance from the city before being allowed to enter it, and that a list was kept of the names, etc., of all persons coming to the city.

Kandahar.

The Persian Government issued a set of quarantine regulations for the control of traffic coming from Baluchistan and Afghanistan. The regulation directed that all roads from Afghanistan to Persia, with the exception of the two main routes, the one from Herat to Meshed and the other from Kandahar to Birjand and Yezd should be absolutely closed, and that a quarantine of fifteen days should be enforced at the frontier on these two roads. The regulations further provided for the establishment of lazarettos provided with a medical staff and sanitary arrangements. Early in July, when the fear of the spread of infection had abated, the period of quarantine was reduced to three days.

Persia.

In Mesopotamia fifteen days' quarantine was imposed against all travellers from India. This portion of Turkish Arabia is peculiarly sacred to the Shiah sect of Muhammadans, who are in the habit of visiting the country on pilgrimage and of sending corpses there for burial. By order of the Turkish Government the entry of Shiah pilgrims and corpses from India and Baluchistan was, as a temporary measure, absolutely prohibited.

Mesopotamia.

**Russian Turkistan and China.**

Quarantine measures were adopted in Russian Turkistan; and on the Kashmir-Kasgar route into China medical officers of the Chinese Government were posted for the examination of travellers, who, if healthy, were permitted to pass on without quarantine detention.

# CHAPTER XI.

## MEASURES TO PREVENT THE SPREAD OF INFECTION BY SEA.

This chapter deals with the quarantine of arrivals from infected ports, and the medical inspection of outward-bound vessels. The measures adopted at the beginning of the outbreak will first be described; next the regulations on the subject contained in the Venice Sanitary Convention of 1897; and lastly, the modifications made in the measures first adopted to bring them into conformity with the Convention.

Division of the subject.

### Original Quarantine Measures.

For a complete understanding of the measures adopted and the regulations issued for the quarantine of arrivals from Bombay and other infected ports at the commencement of the outbreak, it will be necessary to examine briefly the previous history of quarantine regulations in India.

Previous history of sea quarantine in India.

The whole subject of the quarantine of vessels came under the careful consideration of the Government of India in the years 1878 and 1879, and after some correspondence with the Maritime Local Governments the Government of India issued a general resolution explaining the principles that should govern the imposition of quarantine. In enunciating these principles the Government of India had especially in mind the necessity of so far considering the views of other States as to avoid the risk of the enforcement in other countries of restrictions detrimental to the convenience and trade of India. It was considered that a system of medical inspection was sufficient to meet the case of all vessels arriving with persons suffering from any disease which is endemic in India, and that quarantine should be reserved for occasions when there was danger of diseases being imported, which are either unknown or not commonly rife in India—such, for

A and B Quarantine Rules of 1879.

example, as plague and yellow fever. With the resolutions were issued two sets of model rules: one set (the A rules) for medical inspection, which might remain continuously in force; and the other set (the B rules) for quarantine, only to be issued as a temporary measure when the occasion should arise, and with the previous sanction of the Governor General in Council. Both sets of rules were to be enforced under the Indian Quarantine Act (I of 1870). This brief Act, containing only two sections, renders it lawful for the Governor General in Council and with his previous consent for Local Governments to make rules—

for putting any vessel in a state of quarantine;

for regulating the intercourse of vessels in a state of quarantine with the shore, or with other vessels; and

for regulating the intercourse between ports where an infectious disease prevails and other ports.

**B Rules.**

The model B quarantine rules provide in the first place for enquiry by the Health Officer of the Port into the state of the vessel's health. If he is satisfied that there is and has been no case on board of the infectious disease against which the rules are directed, free intercourse with the vessel is allowed. If the Health Officer believes that there is or has been a case of the disease on board, then quarantine is imposed for fifteen days from arrival or from the last subsequent case. The rules permit the disembarkation and detention in segregation of healthy passengers and of healthy members of the crew whose services are not required on the vessel.

**History of quarantine from 1881 to 1893.**

The first occasion after the issue of the model rules on which it became necessary to impose quarantine against plague in Indian ports was in the year 1881. In March of that year news was received that plague had broken out in Mesopotamia and arrivals from the Persian Gulf were at once quarantined in Egypt. The Government of Bombay asked the Government of India to sanction the imposition of the B quarantine rules at Aden, and later, at Bombay and Karachi. The Government of India sanctioned the proposals, and rules were accordingly issued for Bombay and Karachi which followed exactly the B quarantine rules of 1879. But for Aden it was found necessary to impose more stringent regulations. The Resident at Aden reported that the Egyptian rules not only ordered the detention of infected vessels for fifteen days, but also required healthy vessels to be detained for seven days. He ascertained that if these rules were not followed at Aden that port would be considered to be compromised, and that arrivals from Aden would be detained in quarantine to the great detriment of trade. He accordingly from the first imposed

quarantine at Aden against arrivals from the Persian Gulf similar to that imposed at Egyptian ports. His action was approved and a set of rules were issued for Aden on the 20th May, based on the B quarantine rules, but containing this important modification that seven days' quarantine from the date of arrival was imposed on healthy vessels. These rules are printed in Appendix IX.

Quarantine against plague was not again imposed in any Indian port until March 1891, when, owing to the existence of plague in Yemen, Egypt enforced quarantine against arrivals from Lith to Lohaya on the Arabian Coast and the example was followed at Aden. The rules enforced on this occasion followed exactly those issued for Aden in May 1881. In June 1892 quarantine against plague was imposed at Aden against arrivals from Bussorah, and again in July 1893 against arrivals from the coast between Lith and Lohaya. In both cases the quarantine was enforced on the example of Egypt, and the rules were the same as those imposed in 1881 and 1891.

Quarantine against Hong-kong and Canton, 1894.

Quarantine against plague was next imposed in Indian ports in the year 1894 against arrivals from Hong-kong and Canton. On the 4th of June of that year intimation was received from the Governor of Hong-kong that plague was epidemic in that place. On the 16th of the same month the Government of Bombay stated that Egyptian ports had imposed quarantine on arrivals from Hong-kong and requested sanction to the imposition of quarantine at Aden. Sanction was accorded and rules exactly similar to the rules of 1893 and previous years were issued against Hong-kong for the port of Aden. On the 22nd June the Government of India issued instructions to the Maritime Local Governments, including the Government of Bombay, to impose quarantine against arrivals from Hong-kong, under rules similar to the Bombay 1893 rules, but with the following modifications. Isolation was to be dispensed with in the case of vessels carrying a medical officer and on which no case had occurred during the voyage, and eight days' quarantine was to be imposed in the case of vessels not carrying a qualified medical officer, even if there were no reason to suspect that cases had occurred during the voyage. These instructions were less strict than the rules that had been enforced at Aden, but more strict than the model B rules of 1879.

Rules in accordance with the instructions were issued for the ports in the Bombay Presidency and Sind, in the Madras Presidency and in Burma, and for Calcutta and Chittagong in Bengal. The rules issued for the Bombay Presidency were considered to supersede the earlier rules issued for the port of Aden, and the rules for quarantine at that port therefore became assimilated to the general rules in force in ports on the Indian mainland. Subsequently it was ascertained that

Canton was also infected with plague, and quarantine was imposed against that port. The Bengal Government slightly modified the general rules by imposing eight days' quarantine if through the vessel not carrying a qualified medical officer or for other reasons the Health Officer was not satisfied that there was or had been no case of plague on board; by directing the detention of healthy vessels until such measures as were considered necessary had been taken for the disinfection of the mails and cargo; and by recognising pratique granted at Singapore. The Burma rules also gave pratique to vessels that had been quarantined for eight days at Singapore or any other British port, and the Government of Bombay were directed to grant free pratique at Aden to vessels that had undergone quarantine at Bombay or Colombo according to the rules in force at those ports, Hong-kong having been declared free from plague on the 4th September the quarantine restrictions were withdrawn with effect from that date.

The rules against arrivals from Hong-kong at ports in the Bombay Presidency and Sind and at Calcutta are reproduced in Appendix IX.

**Quarantine against Bombay, 1896.**

The next time that quarantine was enforced in India it was against the port of Bombay. Official intimation of the existence of plague in Bombay was received by the Government of India on the 29th September 1896. On the 6th of October the Government of Bombay telegraphed that the Sanitary Board at Alexandria had decided to apply the Egyptian plague regulations to arrivals from Bombay, and they asked for sanction to the imposition of quarantine at Aden.

On the 7th, after receiving the sanction of the Government of India, the Government of Bombay issued rules for the Aden ports* against Bombay. Rules were then issued against arrivals from Bombay at Karachi with effect from the 13th, at Rangoon with effect from the 20th, at Calcutta with effect from the 21st, and at Madras with effect from the 28th, October. The rules were all issued under the authority of the Quarantine Act (I of 1870). It was decided that the danger of the disease spreading by means of the coasting trade was not at that time sufficient to necessitate the imposition of quarantine at minor ports.

**Rules for Aden and Karachi.**

The rules for both Aden and Karachi followed exactly the general rules for ports in India which were issued against arrivals from Hong-kong in July 1894. They thus imposed fifteen days' quarantine in the case of vessels on which cases of plague had occurred, and eight days' quarantine in the case of vessels on which it was believed that no case had occurred, but which did not carry

* *i.e.*, the ports of Aden, Perim, and the Somali coast.

a qualified medical officer, and they allowed immediate free communication in the case of vessels on which no case had occurred and which carried duly qualified medical officers. On the 23rd February the Government of Bombay issued a resolution requiring the Health Officer to make a medical inspection of vessels at Aden and Karachi before granting free pratique, instead of the mere enquiry required by the original rules.

Rules for Calcutta, Madras, and Rangoon.

In sanctioning the imposition of quarantine against arrivals from Bombay at Madras and Rangoon, the Government of India directed that a modification should be made in the rules imposed at those ports against Hong-kong and Canton in 1894, similar to the modification made at the time by the Government of Bengal, namely, that if the Health Officer of the port were satisfied that no case of plague had occurred on board the vessel, free pratique should be granted irrespective of whether or not the vessel carried a qualified medical officer. The rules as thus modified were somewhat less strict than it was considered necessary to enforce at Aden and Karachi, and follow very nearly the model B rules of 1879. Their substance was as follows: Vessels on which a case had occurred were subjected to fifteen days' quarantine; vessels on which it was not ascertained that cases had occurred were granted free pratique or detained for an eight days' quarantine at the discretion of the Health Officer of the port, with the exception that vessels that had already undergone quarantine at Colombo or some other intermediate port were to be immediately granted free pratique. No communication might be held with other boats or vessels or with the shore whilst the vessel remained in quarantine, but the Health Officer might direct the removal of so many of the passengers and crew as were not suffering from illness, and whose services were not required on board, to places of segregation on shore where they were required to complete the period of quarantine. If a case of plague occurred whilst the quarantine was in progress, quarantine recommenced for a further period of fifteen days.

Quarantine against Karachi.

On the 29th December, after obtaining particulars of the outbreak of plague at Karachi, and on hearing that the Sanitary Board in Egypt had established plague regulations against arrivals from that port, the Government of India sanctioned the imposition of quarantine against Karachi at the Aden ports, and on the 30th they directed the Local Governments concerned to issue quarantine rules against Karachi, similar to the rules in force against Bombay, for Calcutta, Madras and Rangoon. Regulations were duly issued in accordance with these instructions.

**Modification of the rules at Karachi.**

Messrs. Mackinnon, Mackenzie & Co., Managing Agents of the British India Steam Navigation Company, then represented that, as Karachi was an infected port equally with Bombay, it was unnecessary to retain the strict quarantine rules enforcing fifteen days' detention of infected ships. After consulting the Government of Bombay, the Government of India directed that the rules then in force at Karachi should be cancelled and that fresh rules should be issued under the Quarantine Act prescribing such medical inspections and other sanitary precautions against arrivals from Bombay as the Government of Bombay considered necessary and sufficient. A new set of rules was accordingly issued on the 3rd February, which provided that if the vessel carried a medical officer, and no case had occurred on board, free pratique should at once be granted. If no case was reported to have occurred on board, but the vessel did not carry a medical officer, then eight days' quarantine was imposed from the date of arrival. If a case had occurred on board, then the sick, their family and immediate attendants together with their baggage were disembarked and removed to segregation shelter, there to remain until permitted to leave by the Health Officer. After these measures had been carried out, the other persons on board were allowed to land under such precautions as the Health Officer considered necessary and the vessel was disinfected.

**Epidemic Diseases Act, section 2 (2), (*a*).**

The Epidemic Diseases Act, contained a special provision for the treatment of vessels arriving from infected ports, and for the inspection of outward-bound vessels. The first part of section 2, sub-section (2) of the Act runs as follows :—

"In particular and without prejudice to the generality of the foregoing provisions, the Governor General in Council may take measures and prescribe regulations for—

(*a*) the inspection of any ship or vessel leaving, or arriving at, any port in British India and such detention thereof, or of any person intending to sail therein or arriving thereby, as may be necessary."

It has been stated in Chapter VI that the Maritime Local Governments of Bombay, Madras, Bengal, and Burma were all authorised under section 2, sub-section (3) to exercise the above powers within their respective territories. The rules already issued by Local Government under the Quarantine Act remained in force after the passing of the Epidemic Diseases Act, and were in some cases extended and modified. But first the Government of Bombay and then the Government of Madras issued fresh quarantine rules under the

Epidemic Diseases Act, and the final rules framed in accordance with the Venice Sanitary Convention were all issued under that Act.

Extension of quarantine to minor ports.

As the extent and virulence of the epidemic in the Bombay Presidency increased, it became necessary to extend the quarantine rules to some of the minor ports on the south-west and east coasts of India. Quarantine against Bombay and Karachi was imposed on the 13th January 1897 at Tuticorin, the Madras port for the island of Ceylon. On the 15th January the Chief Commissioner of Burma telegraphed that the rice export season brought vessels from the Bombay Presidency to the minor Burma ports, and requested that sanction might be given to the issue of quarantine rules against Bombay and Karachi at the ports of Akyab, Moulmein, and Bassein. This sanction was given on the 18th. Early in February quarantine against Bombay, Karachi and Goa was imposed at Mangalore and the southern ports of Malabar (Madras Presidency) and quarantine against Goa was also imposed at Tuticorin. On the 27th of the same month the Government of India sanctioned the imposition of quarantine rules for all ports in the Madras Presidency against all ports in the Bombay Presidency and Sind, and against Goa. In the first part of March quarantine rules against Goa were issued for the ports of Calcutta, Rangoon, Akyab, Moulmein, and Bassein.

Inspection of the inward sea traffic at Bombay.

When plague became widely diffused in the Bombay Presidency, the Local Government took measures to prevent the spread of infection from infected ports to less infected or healthy localities. In especial when the outbreak declined in the City of Bombay, and a large influx by land and sea began from other parts of the Presidency, careful arrangements were made under the control of Surgeon-Major MacCartie, Health Officer of the Port, for the inspection of the inward sea traffic. "In addition to the people who had fled from Bombay," General Gatacre remarked, "an influx of people, not inhabitants of the city, flying from the plague in their own villages, was to be anticipated. Many places were now suffering more than Bombay, and partly on this account, and partly to escape the vigorous measures of the local authorities to stamp it out, people had begun to flock into the city from the districts most affected. Over this influx it was necessary to keep a careful watch." As early as the 2nd March the Government of Bombay issued a resolution directing the Municipal Commissioner to make arrangements for the medical inspection, and if necessary the detention under observation of all persons entering Bombay by rail, sea, or road. On the 12th April they issued rules under the Epidemic Diseases Act authorising the Bombay Plague Committee to appoint

Regulations of the 12th April.

plague authorities who were empowered by the rules to medically inspect persons coming to Bombay Island by sea, by vessels, including native craft, which had touched at any port in India between Bhatkal (in the north of the Kanara District of theBombay Presidency) and a line ten miles north of Karachi, and to detain at the hospitals appointed for the purpose any persons whom they found or suspected to be suffering from plague. The rules further provided that the master of any vessel coming from the infected sea coast should report any cases of plague or deaths on board, that he should not allow the landing of passengers or crew until permitted to do so, and that passengers and crew should only be landed during the day time and at appointed landing stages. The inspection of the inland sea traffic like that of the outward sea traffic was performed by the establishment of the Port Health Office, which was largely augmented for the purpose. The inward sea traffic inspection staff consisted of three commissioned medical officers, two medical practitioners, a lady inspector, two lady doctors, a lady medical student, five assistant surgeons, thirteen medical students, and an office establishment. Further assistance was furnished by the outward inspection staff. The staff was provided with steam-launches, Port Trust barges, etc.

Establishment.

Steamer traffic.

General Gatacre stated that the examination of the steamer traffic presented comparatively little difficulty, especially as Mr. Shepherd, who owns the line which carries almost all the local passenger traffic, came forward with the most valuable help and advice. The steamers arrived at more or less fixed hours, and the passengers were landed at certain landing stages. The only difficulty therefore was the provision of the staff. "The examination of the native craft presented many obstacles. Arriving at all times of the night and day, landing their passengers anywhere, and owned and sailed by men who were in full sympathy with those of their passengers who wish to evade inspection, special measures had to be adopted to prevent cases of plague being smuggled into Bombay by them. For customs' purposes there is at all times a regular patrol of the whole harbour from Middle Colaba as far as Sadri, and the officials of the Customs are always on the watch to prevent persons from landing in any but the regular places. The first step, therefore, was to ask the Collector of Customs to refuse to allow anyone to land who had not obtained a pass certifying that he was free from plague. All native craft were ordered to bring up at one of the following anchorages:—Tucker's Beacon, Free Anchorage, Dutiable Anchorage. At each of these places there was a barge stationed with a medical staff, detailed from the medical students placed on the duty. As soon as a craft came to anchor

Native craft.

she was boarded, and the passengers examined by a medical officer, who gave a certificate of health if the result of the examination was satisfactory. This work was extremely arduous from the number of the boats and also from the fact that most of these boats carry vegetables, etc., for the Bombay market. They arrive at about midnight, and if their men were not allowed to go ashore the first thing in the morning, great inconvenience would be felt by the whole city for want of fresh vegetables, etc. The work of inspection had therefore to be carried on mainly in the night."

**Treatment of the suspicious.**

Sheds were erected at Nariel Wadi, Reay Road and Wari Bandar for the shelter of persons detained under observation, and the shed on the Malet Bunder for the inspection of Mecca pilgrims was used for the same purpose. The procedure followed in dealing with suspected cases varied according to the locality whence the person had come. In the case of passengers from Cutch-Mandvi and the Kolaba district detention was more vigorously enforced than in the case of passengers from less infected localities. Persons developing plague while under observation were sent for treatment to Government or private plague hospitals.

**Results of the inspection.**

The following statement shows the results of the inspection :—

| Month. | Persons suspected. | Sent to observation camp. | Plague cases detected from March 1st to June 30th. |
|---|---|---|---|
| April | 106,272 | 447 (from April 13th) | 57 |
| May | 123,812 | 3,047 | |
| June (up to 21st) | 33,205 | 1,341 | |

**Rules for minor ports in Bombay.**

To protect minor ports against Bombay the two resolutions of the 17th February, which have already been noticed in the examination of the railway travellers' inspection rules, provided for the appointment of officers to examine, and if necessary to detain, persons whether passengers or members of a boat's crew, arriving in vessels, from the direction of Bombay. On the 6th March the Government of Bombay issued a general resolution empowering the Commissioners of divisions to apply certain rules at the ports within their jurisdiction against arrivals from infected ports. The rules provided for the medical inspection of vessels, for the removal of the sick, for the segregation of passengers on shore, if suitable accommodation were available, for a quarantine of infected vessels for eight days from the date of arrival or occurrence of the last subsequent case, for the destruction of bedding and rags, for the disinfection of articles likely to carry the seeds of the disease, and for the quarantine of healthy vessels

up to eight days from the date of departure from the infected port.

**Precautions against arrivals from Cutch.**

The outbreak of a violent epidemic of plague in Cutch-Mandvi was a serious menace to other ports in the Bombay Presidency with which it is in constant communication, and special arrangements were made to prevent the spread of infection by arrivals from the Cutch port.

**Quarantine at Aden.**

The quarantine arrangements at Aden were the subject of considerable correspondence, the fact that Aden is the port of call for ships sailing from India to Europe rendered the matter specially important and difficult. The history of quarantine at Aden has already been described, and it has been stated that the rules framed for Aden against arrivals from Bombay in October 1896 followed the general rules issued for Indian ports against Hong-kong in 1894, and were somewhat stricter than those enforced against Bombay at ports on the Indian mainland, inasmuch that they required eight days' quarantine of healthy vessels which did not carry a qualified medical officer.

**Modifications of the Aden Rules.**

Subsequently certain modifications were made in the Aden rules, of which the most important was the imposition of ten days' quarantine from the date of departure from Bombay or Karachi on persons landing at Aden. This rule was introduced on the 3rd February, with the previous sanction of the Governor General in Council, because the voyage from Bombay and Karachi does not occupy the full ten days which has been recognised for practical purposes as the maximum incubation period. It was also decided in correspondence with the Government of Bombay that the Health Officer should not, for fear of being compromised, visit the vessel until the ten days' period expired, and that vessels using Aden merely as a port of call, and not holding communication with the port, need not be examined or detained. The Government of Bombay undertook the amendment of the rules in accordance with these decisions, in communication with the Resident at Aden, but before this work was completed the whole question of sea quarantine had been reconsidered in the light of the provisions of the Venice Sanitary Convention. The Government of Bombay reported on the 30th April that no practical difficulty was being experienced in working the Aden rules.

**Revised rules issued by the Government of Madras.**

Before the general discussion of quarantine in the light of the Venice Convention commenced, the Government of Madras proposed (on the 3rd April) important modifications in the rules in force in the ports of the Madras Presidency, based on the orders of the English

Local Government Board of 1890, and in the direction of the alterations subsequently made in conformity with the Convention.

The main object of the alteration was to avoid the detention of the sick and healthy together on boardship. With the sanction of the Government of India the rules previously issued by the Government of Madras under the Quarantine Act were cancelled by a notification under that Act, and in their place a set of rules was issued under the Epidemic Diseases Act (June 22nd). It is unnecessary to do more than notice the main features of these rules as they were afterwards replaced by rules drawn up in accordance with the Venice Convention. If the vessel were found to be healthy after examination, free pratique was to be at once granted; if the vessel were found to be infected, the following principal measures were prescribed. The sick were, if possible, to be landed and detained in an isolation hospital, the healthy were to be landed and detained in segregation up to ten days from the date of landing or the occurrence of the last subsequent case. Contaminated clothing and bedding were to be destroyed, and other articles likely to carry infection were to be disinfected. The ship was also to be disinfected, and if possible, the tanks on board were to be emptied, disinfected, and refilled.

## Original Measures for the Inspection of outward-bound Vessels.

The measures for the examination of outward-bound vessels were all enforced under the clause of the Epidemic Diseases Act, which has been quoted in the preceding section of this chapter.

Rules for Bombay and Karachi.

The Government of Bombay telegraphed to the Government of India on the 27th January that it was considered urgently necessary to medically inspect persons leaving Bombay by sea, and that a complete scheme had been prepared and rules drafted under the Quarantine Act. The telegram recited the rules and asked the Government of India to accord sanction to them. A reply was sent, on the 28th January, to the effect that the Government of India were doubtful whether the rules came entirely within the authority conferred by the Quarantine Act, but that the rules might be acted upon, and that the Epidemic Diseases Bill, which was then under consideration, contained a provision enabling rules to be framed of the nature contemplated. It was also suggested that similar rules should be enforced at the port of Karachi. Accordingly the Government of Bombay issued rules under the Epidemic Diseases Act for the inspection of vessels sailing from the ports of Bombay and Karachi on the 6th

and 15th February respectively. The rules for the two ports were similar and contained the following main provisions. No vessel might leave the port without medical examination by the Health Officer, and until the master had obtained a bill-of-health certifying that no case of plague existed on board. If a case suspected to be plague were found during the examination, the bill-of-health might not be granted until the person suspected had been removed. After the grant of the bill-of-health no person or cargo might be taken on board without a fresh medical examination of the vessel. Port clearance might not be delivered to the vessel until the master was in possession of the bill-of-health. Practically the measures came to this, that no vessel was permitted to depart until everyone on board had been examined, and any case suspected to be plague had been removed.

**Results of the inspection at Bombay.**

These measures were worked in the port of Bombay with great care and with eminent success.

The number of persons examined in the months of February, March, April and May 1897 amounted to 79,623, 91,779, 80,608 and 81,398, respectively, giving a total of 333,408 and an average of over 80,000 a month.

**Staff.**

To examine this enormous number of persons, the following large staff was employed :—

1 Port Health Officer (Surgeon-Major MacCartie).
1 Additional Port Health Officer.
3 Commissioned Medical Officers.
3 Assistant Surgeons.
1 Hospital Assistant.
2 Lady Doctors.

In addition to the above, the services of another lady doctor were utilised on at least two days of each week, and three qualified medical officers were employed under the supervision of the Customs Department, chiefly in connection with the inspection of small native sailing craft. On mail days the staff was supplemented by at least two and sometimes by four of the Professors of the Grant Medical College.

**Difficulties.**

Dr. MacCartie stated that this large staff was able to get through its duties satisfactorily only by working at very high pressure. The magnitude of the work resulted, not only from the large number of persons to be examined, and because vessels sail at all hours from different portions of the extensive harbour, but because for the detection of plague a rigid inspection is required of all persons presenting themselves for examination.

Any man with fever or buboes was an object of suspicion and had to be examined with the utmost care. In the months of

February and May, the numbers placed on one side for temperature observation ranged from 20 to 25 per cent., and as many as a dozen thermometers were in use at the same time.

Place of examination.

At the port of Bombay vessels start from one of three places—

(1) the outer wall of the dock ;

(2) the docks ;

(3) the stream.

In the first case the passengers were examined on shore in sheds specially arranged on the dock wall, and the crews were mustered and examined on board before the passengers were allowed to enter the ship. The vessels starting from the outer wall of the dock are chiefly engaged in the coasting traffic, and their passengers were the most likely to be infected. In the second and third cases the examination of both passengers and crew was made on boardship before the vessel started.

Examination of crew.

Experience showed that the examination of the crew was the most important part of the work. In the first place their number exceeded the number of the passengers. In April and May out of a total of 162,006 examined, 86,938 persons belonged to the crews of vessels. In the second place the crews were much more likely to carry infection than the passengers. Dr. MacCartie has recorded the following observations on this point:—

"Every Peninsular and Oriental Company's liner during the height of the plague, on arrival in Bombay, was, under the law and practice of the port, forced to discharge its native crew: by law the crew can and do claim their discharge. Three or four days, sometimes one day, before a vessel's departure another crew has been signed on the articles. This fresh crew has come from the slums of plague-stricken Bombay, whilst the passengers who are almost all Europeans have come from up-country stations and boarded their vessel direct from the train. Even in the case of local passengers they have come from parts of Bombay comparatively free from plague. The natural result has been that during the height of the epidemic no passenger, except two postal officials, both natives, was removed on suspicion from any vessel, whilst it was found necessary, in almost every instance, to remove several of the native crew."

Success of the measures.

The thoroughness with which the measures were carried out in the port of Bombay is attested by the fact that only in very few instances did a person infected with plague escape detection and depart on a vessel sailing for the port. A case occurred on board the troop-ship *Dilwara*, two on board the pilgrim ship *Pekin*, and one case believed to be plague on board a liner. In addition there was the case

of the two Portuguese stewards, mentioned in Chapter II, who were believed to have caught plague from infected articles carried in bundles of clothing left unopened until the vessel arrived in the Thames.

**Risk of the spread of infection by sea traffic said to be small.**

The facts recited above show clearly how small is the risk of infection being carried to Europe by persons sailing on vessels from an infected port, provided that an efficient system of inspection is maintained at the port. Dr. MacCartie considers that the danger of plague spreading on a sea-going vessel is very small, and made the following remarks in support of this contention :—

"The *Dilwara* and *Pekin* were therefore infected vessels, and the latter vessel carried over 1,000 of perhaps the most insanitary and dirty people, who travel by sea—pilgrims—yet the disease did not catch on, nor did the passengers on board these very crowded vessels suffer in health from the fact that plague cases were amongst them. During the inspection on boardship from February up to date, many persons have been removed from outward-bound vessels as suspicious cases. Some of these developed plague after removal, but in no instance did the disease appear amongst those who remained on the vessels. They sailed away and no more plague occurred, from which it would seem that the circumstances of a sea voyage are inimical to the plague microbe: and that people affected by manifest plague, or in whom the disease is incubating, may be on boardship without danger to the rest of the passengers, unless, indeed, the number of infected ones is very great."

In the month of May an alteration was made in the rules for the port of Bombay to meet the case of vessels using Bombay only as a port of call, and holding no communication with the port except through persons embarked there. It was provided that in this case the examination might be confined to the persons embarking.

**Calcutta and Madras.**

The medical inspection of vessels was enforced at the ports of Calcutta and Madras as well as at ports in the Bombay Presidency. This measure was considered necessary in order that there might be no doubt in European countries as to the freedom from plague infection of vessels sailing for those ports. Although both Calcutta and Madras are situated a very long distance from the infected area, there was a possibility—likely to be considered greater in foreign countries than it was in India—that infected persons might embark there.

**Bengal Rules.**

The Government of Bengal issued rules for the port of Calcutta on the 10th February, which were similar to those in force at Bombay and Karachi, but contained the additional provision that if a plague case were detected on board, the vessel must be detained seven days before being permitted to depart.

The rules were drawn up in a general form applying to all vessels sailing from the port of Calcutta, but were in practice only applied to vessels bound for ports out of India.

The Government of India subsequently addressed the Government of Bengal on the subject of these rules, and suggested that it was not necessary to detain all vessels on which a case was discovered: if the vessel carried a medical officer she might be allowed to depart after the prescribed precautions had been taken, but a vessel carrying no medical officer should be detained for ten days in the interests of the persons on board. On the 25th May the Government of Bengal issued a fresh notification for the inspection of vessels sailing to ports out of India from any of the Bengal ports which embodied the above suggestions. The notification contained an additional rule, borrowed from Madras, preventing any person from embarking who had within the previous ten days resided in or visited an infected port of India.

It may here be said in anticipation that in the rules that finally issued the detention of a vessel from which a plague case had been removed was not prescribed, the experience in Bombay having shown that this was not necessary. The prohibition against the embarkation of persons who had been in an infected locality within ten days was also cancelled.

Madras Rules.

The Government of Madras issued rules for the inspection of vessels sailing from the port of Madras for ports in other countries on the 23rd February, and similar rules for other ports in the presidency on the 8th April. The rules followed those prescribed by the Government of Bombay with two additions. The first was the prohibition against the embarkation of persons who had within ten days resided nor visited an infected locality, which has been alluded to above. The second prescribed that on the removal of a person suffering from plague the parts of the vessel that he had frequented should be disinfected. At the commencement of the outbreak the Government of Ceylon imposed fifteen days' quarantine and other stringent rules against arrivals from the west coast of India. In order to protect Tuticorin against such regulations, the Government of Madras prescribed, in a separate notification of the 22nd February, rules for vessels sailing from that port to ports in the island of Ceylon, the terms of which followed exactly those of the general rules. Later on the Government of Ceylon stationed a medical officer at Tuticorin for the examination of persons embarking for the island, and on the 4th May the Government of Madras issued a notification prohibiting any deck passenger of the labouring classes (coolie emigrant) from embarking until he had satisfied the medical officer of the Colonial Government that he had not been in an infected part of India for ten days, and that he was free from plague infection. Other passengers were not compelled

Tuticorin and Ceylon.

to obtain a certificate from the Colonial doctor, but they were permitted to do so, and they were warned that unless they possessed such a certificate they were liable to be prevented from landing at Colombo. The Government of Madras issued a special set of rules for vessels sailing from east coast ports to Burma. These rules were similar to the general rules, but omitted the provisions about persons who had been in an infected locality, and dispensed with examination at a port of call except in the case of the passengers embarked there.

## The Venice Sanitary Convention of 1897.

**General scope and arrangements.**

In the preceding chapter the provisions of the Venice Sanitary Convention dealing with the prevention of the spread of plague by land have been noticed; in Chapter XIV the Convention will be considered in connection with the regulations restricting trade and communication issued in foreign countries. The present chapter is specially concerned with the Convention rules for the inspection of the inward and outward bound sea traffic, but it will also be convenient to notice briefly the general scope and arrangement of the Convention and the circumstances attending its adoption.

**Circumstances leading up to the Venice Sanitary Conference.**

Great alarm having been experienced in European countries in consequence of the outbreaks of plague at Hong-kong and in India, it was considered necessary to formulate an international code of regulations, with a view to prevent the infection from being conveyed from one country to another, and notably from the East into Europe by either a land route or by sea. An international conference, at which twenty-three countries were represented, assembled at Venice for this purpose on the 16th February. At the last sitting of the conference, which was held on the 19th March, the Convention was signed by the representatives of eighteen Governments, including the representatives of Her Majesty's Government.

**Indian delegates.**

The Government of India nominated Surgeon-Major-General Cleghorn as one of the delegates of Her Majesty's Government. Surgeon-Colonel Richardson represented the interests of British India at the Conference pending Surgeon-Major-General Cleghorn's arrival.

**Regulations are based on previous Conventions.**

The regulations* prescribed by the Convention are based on the conclusions of the Sanitary Conferences of Venice, 1892; Dresden, 1893; and Paris, 1894; these conclusions were modified to meet the

* The Regulations are reprinted in Appendix IX.

special peculiarities of plague, and in accordance with modern scientific views regarding sanitary precautions for the prevention of the spread of epidemic disease.

Important points of difference.

The following are the most important points in which the Convention of 1897 differs from the previous Conventions on which it is based:—

(i) The fact that the period of incubation in the case of plague may be considerably longer than in the case of cholera led to several important modifications. By the Venice Conference of 1892 the period of incubation for cholera was fixed at five days. The conference of 1897 adopted a ten days' incubation period for the purpose of plague regulations.

(ii) The list of articles of commerce which may be considered "susceptible" was considerably increased; but it is left to the option of the Governments concerned to allow or prohibit the importation of the commodities, on the "susceptible" list, no article being subject to absolute prohibition.

(iii) Modern principles of disinfection were substituted for the obsolete system of land quarantine, but, with a view to meet the wishes of Governments who may find it difficult to thus protect their borders, the option is given of closing the frontiers to travellers and merchandise.

(iv) The provisions of the Paris Convention on the subject of the regulation of the pilgrim traffic were embodied in the Venice Convention, but in several respects those provisions were altered in the directions for which the Government of India have from time to time contended.

Measures for the prevention of plague to be adopted outside Europe.

The first chapter of the regulations prescribed by the Convention deals with the measures for the prevention of plague which are to be adopted outside Europe. In the first place, it is laid down that the Governments which adhere to the Convention are to notify to other Governments the existence of plague within their several jurisdictions, and must communicate to them a statement of the measures that are being carried out to prevent its diffusion. This requirement as to notification is, however, subject to certain important conditions. Thus the area to be deemed infected is strictly limited to the actual district, town, village, etc., where the disease prevails; and no locality is to be deemed infected merely on account of the importation into it of a few cases of plague which have led to no diffusion of the malady. It is also provided that any area in which plague has existed will cease to be considered as infected

Notification.

when it is officially reported that no death or fresh case of plague has taken place for ten days after the recovery or death of the last case, provided that the necessary measures of disinfection have been carried out.

The Secretary of State forwarded instructions to the Government of India with regard to the method of notification in a despatch, dated the 8th of July. It was then arranged to send telegraphic information to the States who are parties to the Convention of the extension of plague to any fresh local area, or of its extinction in any area where it had existed. It was also arranged to send information of any important change or extension of remedial and preventive measures.

**Inspection of vessels sailing from infected ports.**

The regulations next deal with the measures to be taken on the departure of vessels from infected ports. It is laid down that every person sailing on the vessel must be examined on shore, immediately before embarkation, by a medical officer appointed by the Government, and that the Consular authority interested in the ship may be present at the inspection. All infected and suspected articles must be subjected to careful disinfection on shore and in the presence of the Government medical officer in accordance with the rules for disinfection prescribed in Chapter III of the regulations, and no persons showing symptoms of plague may be permitted to embark.

**Pilgrim traffic.**

The rules regarding the pilgrim traffic form the next portion of the regulations. It has been stated above that they are derived with some modifications from Paris Sanitary Convention of 1894. The subject is a complicated one, and it is unnecessary for the purposes of this report to examine the details of the rules.

**The Red Sea and the Suez Canal.**

The important subject of the control of the general traffic in the Red Sea and the Suez Canal is next dealt with. The regulations are based on the threefold classification of ships into healthy, suspected, and infected, adopted in the Venice Convention of 1892, with the modifications rendered necessary owing to the period of incubation in the case of plague having been fixed at ten days. The rules are described in detail in Chapter XIV, in which is also given an account

**Persian Gulf.**

of the arrangements for the Persian Gulf prescribed in the first chapter of the Convention regulations.

**Measures to be adopted in Europe.**

The second chapter of the regulations deals with the measures to be adopted by the European Governments which have assented to the terms of the Convention. The provisions relating to notification have been mentioned above. In Chapter II allusion has also been made to

the regulations regarding the importation of merchandise, and this important subject will be further discussed in Chapter XIV. The measures to be taken on land frontiers have been noticed in the discussion on land quarantine contained in Chapter X.

Measures to be adopted at ports of arrival.

The portion of the second chapter of the regulations which relates to traffic by sea and the measures to be adopted at ports of arrival is of great interest, not only because of its direct bearing on the conditions of intercourse between India and Europe, but also because it contains the conclusions of the Conference on the subject of the quarantine of vessels. The threefold division of vessels, referred to above, is maintained in this chapter. Healthy vessels are those on board of which there has been no case of plague; suspected vessels are those on which, though cases of plague have occurred, no fresh case has occurred within twelve days; and infected vessels are those on which plague has been present within twelve days of the date of arrival. The period of twelve days is calculated, as in the case of the seven days' period in the Convention of 1892, by adding two days to the period of incubation.

Threefold classification of vessels.

Infected vessels.

The regulations for infected vessels require the sick to be landed and isolated, and the remainder of those on board to be subjected, at the discretion of the local authority, either to "observation" or to "surveillance" for a period which is not to exceed ten days from the occurrence of the last case of plague. The term "observation" means detention under observation either on board a ship or in a place of segregation on shore. Persons subjected to "surveillance" are not to be isolated, but are to be allowed to proceed at once to their destination where they are to remain under medical supervision. In the case of an infected ship the dirty linen and other effects of the passengers and crew which the local sanitary authorities may consider likely to be contaminated, must be disinfected. So also must the parts of the ship where the sick have resided, and the local authorities may require a more extensive disinfection to be carried out. Lastly, the bilge-water must be thrown out after disinfection and fresh drinking-water supplied.

Suspected vessels.

In the case of suspected vessels, a medical inspection and the same process of disinfection, discharge of bilge-water and supply of fresh drinking-water is prescribed. It is further recommended that the crew and passengers should be subjected to "surveillance" for a period of ten days from the date of arrival of the vessel.

Healthy vessels.

Pratique is to be given at once to healthy vessels, but it is also provided that, at the option of the local authority, the precautionary measures enforced in the case of suspected ships, except the disinfection of the vessel may be required; and it is also recommended

that the passengers and crew should be subject to "surveillance" for a period sufficient to complete a term of ten days from the date of departure of the vessel from the infected port. In the case of both suspected and healthy vessels it is recommended that the crew should only be allowed to land on duty.

Other chapters.

The third chapter of the regulations contains a set of instructions regarding the best way to carry out the various processes of disinfection. The fourth chapter consists of a set of precautionary rules recommended for ships sailing from infected ports at the time of departure, during the voyage and on arrival. The fifth and last chapter deals with matters connected with administration and finance.

## Regulations for Inspection of inward-bound Vessels based on the Venice Convention.

### INSTRUCTIONS OF THE GOVERNMENT OF INDIA.

Revision of the Local Government Quarantine Rules.

In the circular issued by the Government of India on the 1st of June, forwarding a copy of the Venice Convention, the Maritime Local Governments were directed to revise the quarantine rules against arrivals from infected ports in accordance with the regulations of the Venice Convention. It was stated that the period of observation should be reduced from fifteen to ten days, and that the Convention regulations should be followed in the case of vessels on which there is a case of plague at the time of arrival, or on which it is believed that a case has occurred during the voyage. Special stress was laid upon the undesirability of detaining the sick and healthy on board ship together. It was stated that the "sick should be landed and treated in an isolation hospital, and the healthy should be landed and detained under observation in suitable segregation shelter for a period of ten days from the occurrence of the last case. The disinfection and other precautionary measures prescribed by the Conference should also be complied with."

Period of observation.

Infected vessels.

Healthy vessels.

The following directions were given with regard to the treatment of vessels on which no case of plague has occurred during the voyage:—

"The maximum period of detention of a vessel on which the Health Officer is satisfied that no case of plague has occurred should be ten days from the date of departure from the infected port. If the Health Officer is not satisfied that there has really been no case on board or if ten days have not elapsed since the date of departure from the infected port, the vessel may be detained, at his discretion,

up to this period. In any case in which a vessel is given free pratique less than ten days after her departure from the infected port the Health Officer should be empowered, on the analogy of the rules for the observation of persons travelling by railway which have been framed by several of the Local Governments, to detain under observation in a suitable place of segregation, up to a maximum of ten days from the date of the departure of the vessel, any person landed from the ship whom he may consider to be in any way likely to carry infection. Any articles of clothing or other effects belonging to the persons detained or to other persons which, by reason of their dirty condition or otherwise, may be considered likely to be contaminated, should be disinfected. Discretion may be given to the Health Officer to apply the other provisions regarding disinfection, etc., prescribed by the Convention in the case of suspected ships. The Local Government may also make such arrangements as are possible for the surveillance of persons who are not detained, on arrival at their destination. Free pratique granted at Colombo or other intermediate port should be recognised."

## BOMBAY.

Draft rules for the Port of Bombay.

With a letter of the 22nd July the Government of Bombay forwarded a set of draft rules for the inspection of vessels arriving at the port of Bombay from infected ports. These rules appeared to the Government of India to be generally suitable and in accordance with the Venice Convention. They pointed out two defects—

(1) The Health Officer was given discretion, in the case of a healthy ship which has not completed ten days from the date of departure from an infected port, to (*a*) refuse pratique until the end of the ten days' period, and (*b*) until all persons on board had been subject to medical supervision up to ten days from the date of departure. It was understood that alternative (*a*) contemplated the detention of all persons on board ship. The Government of India considered that this alternative was open to objection, and that the passengers should be disembarked and kept under "observation" or "surveillance" on shore.

(2) The rules left it to the discretion of the Health Officer to allow the healthy passengers and crew of an infected vessel to land for the purpose of being kept under observation. The Government of India considered that it should be obligatory to land the healthy and keep them under observation on shore, and that an exception should be made to this rule

only in the case of those members of the crew whom it is necessary to detain on board for the care of the vessel.

It was further pointed out that the rules should be framed so as to apply to all infected and suspected vessels whatever their port of origin, and that the form might follow more closely the regulations of the Venice Convention.

**Aden and other ports in the Bombay Presidency.**

The Government of India also suggested that the rules for Aden, Karachi, and the other ports in the Bombay Coast at which it was considered necessary to maintain an inspection of the inward sea traffic should be modified on the lines of the draft Bombay rules. It was recognized that in the case of Aden the imposition of quarantine is complicated by the importance of keeping the port clean in the eyes of the world. The Government of India considered, however, that if proper arrangements were made and proper precautions taken, the enforcement of the regulations prescribed by the Venice Convention would not injure the reputation of the port.

**Draft rules for Aden.**

With a letter dated the 4th October the Government of Bombay forwarded a set of draft rules, framed in accordance with the principles of the Venice Convention, for the treatment at Aden of vessels arriving there from ports declared to be infected with plague.

**Threefold classification of vessels.**

The rules were based on the threefold classification of ships into "healthy," "suspected," and "infected," and prescribed a different treatment in the case of vessels whose destination is Aden and vessels merely using Aden as a port of call. The following is a summary of the rules.

**Period after which free pratique may be given.**

No vessel may be given pratique until ten days from the date of its departure from an infected port. A vessel which carries no qualified medical officer may not be granted free pratique until ten days from the date of its arrival at Aden. Until the ten days' period has expired the vessel must remain at the quarantine anchorage and may have no communication with the shore.

**Vessels whose destination is Aden.**

If Aden is the destination of the vessel, an officer goes alongside on its arrival and ascertains whether ten days have expired since its departure from an infected port. If ten days have expired, and if the vessel carries a qualified medical officer, the inspecting officer goes on board and after the necessary investigation classifies the ship. The rules of the Venice Convention for "healthy," "suspected" or "infected" ships are then applied according to the condition of the vessel. If it is ascertained that ten days have not expired since the departure of the vessel from an infected port, or if it carries no qualified medical officer, it is detained at the quarantine anchorage until, in the former case, ten days have expired since its departure from an

infected port, or, in the latter case, ten days have expired since its arrival at Aden. The vessel is then classified and treated according to its condition. If, however, it is ascertained at any time after its arrival that the vessel is infected, the measures for infected ships are at once enforced.

Vessels using Aden as a port of call.

If the vessel merely uses Aden as a port of call, an officer goes alongside, as before, and ascertains whether ten days have expired since its departure from an infected port. If ten days have expired and if the vessel is found to be healthy it must be given pratique. Otherwise it must remain at the quarantine anchorage during its stay in port. No persons may, in such case, be landed except at the quarantine camps, and no communication may be held with the shore, or with other vessels, except for the purpose of landing the mails in quarantine and the embarkation and disembarkation of passengers in quarantine. If ten days have not expired since the departure of the vessel from an infected port, or if it carries no qualified medical officer, it must likewise remain in quarantine. The rules require the inspection to be ordinarily made during the day time, and the Government of Bombay have approved of the suggestion of the Resident that when inward-bound vessels arrive in the night, and do not care to stay for examination by day, the usual form of report should be sent on board to be filled in by the Commander or Medical Officer.

The rules contain the following miscellaneous provisions:—

Other provisions of the rules.

Transhipment may be made in quarantine of passengers, or other persons, or mails, or cargo, from a vessel in quarantine to another vessel, provided that thereafter the other vessel remains in quarantine. Mails or cargo brought by a vessel from an infected port may be landed under necessary precautions. The Port Officer must facilitate the conveyance to vessels in quarantine of provisions, etc., under necessary precautions. Vessels which have communicated with vessels from an infected port are subject to the same rules as arrivals from an infected port. All vessels which have undergone the prescribed medical inspection and quarantine should have the fact clearly stated on their bills of health.

The Government of India approved the draft Aden rules on the 25th of October.

Modification of the Aden rules with regard to the grant of free pratique.

In January 1898 the Government of India issued instructions that the provision of the Aden Quarantine Rules refusing free pratique to vessels with less than a ten days' healthy passage from an infected port should be cancelled, and that such vessels should immediately

be granted free partique subject only to the enforcement of the precautions authorized in Chapter II, Section VIII, of the Convention, in the case of healthy vessels arriving at European ports. The change was made at the instance of the British Foreign Office who considered that the refusal to grant immediate free pratique to healthy vessels was opposed to the Venice Convention, even though the vessel had within ten days been in an infected port. In issuing the instructions the Government of India stated that vessels merely using Aden as a port of call should as before be given the option of remaining in quarantine instead of seeking free pratique since experience had shown that the delay inseparable from medical examination, etc., renders the former course more convenient for them.

## BENGAL.

Draft rules for Calcutta.

The Government of Bengal forwarded a set of draft quarantine rules for the port of Calcutta with a letter dated the 17th July. The Government of India considered that these rules were well adapted to meet the requirements of the Venice Convention, but pointed out that the form was incorrect inasmuch as it made the rules of permanent application, and that the definition in the draft rules of the term "observation" was not in accordance with the Venice Convention since it contemplated the detention of the persons to be observed on board the vessel in which they arrived. It was stated that healthy passengers should never be detained on board ship, and that in the cases of infected vessels no one should be left on board except the persons whose presence was necessary for the care of the vessel.

Healthy passengers not to be detained on board ship.

Publication of revised rules for Calcutta.

The Government of Bengal made the necessary corrections and then issued a notification (dated the 26th August) under the Epidemic Diseases Act prescribing the new rules, and, with the previous sanction of the Governor General in Council, a second notification under the Quarantine Act, cancelling the rules at the time in force.

Threefold classification of ships.

The rules in the first place make the threefold classification of ships of the Venice Convention, and define the terms "observation" and "surveillance" as in the Convention. They then provide for the hoisting of signals, the position at the anchorage to be taken up by infected and other vessels, the prohibition of communication with the shore and with other vessels until permission is granted, and inspection by the Health Officer of the Port.

Treatment of vessels of each class.

Rules are next laid down for the treatment of infected, suspected, and healthy vessels, which follow the rules prescribed by the Venice Convention. These rules summarize in a very clear and con-

cise manner the way to treat infected vessels and vessels from an infected port. They are reproduced at length in the following extract :—

"*Rules relating to infected ships*— Infected ships.

(1) If an infected ship has, under Rule IV, been stopped at Diamond Harbour, she will await the orders of the Health Officer there. If under Rule V, she has been brought up to Mateabrooj, the Health Officer will direct the Commander to take her to the sanitary station at Diamond Harbour, or elsewhere as may be appointed by Government, and to await orders there.

(2) On arrival at the sanitary station, the sick will be immediately disembarked and isolated under the order of the Health Officer.

(3) The other persons on board shall also be disembarked and, when necessary, kept under observation at the sanitary station for a period varying, in the discretion of the Health Officer, according to the sanitary condition of the ship and the date of the last case. Such period must not exceed ten days from the date of the last case, whether that occurred on board ship or during the period of observation on shore. It is also in the discretion of the Health Officer to allow such persons to proceed to their destination on their giving a written undertaking, in the form annexed as Appendix I, to submit themselves to surveillance by the Medical Officer (if any) appointed for the purpose, at their destination, for a period of ten days from the date of the arrival of the ship. The undertaking shall be executed in duplicate, and one copy shall be sent by the Health Officer to the Medical Officer concerned.

No one arriving on the vessel shall be left on board except those persons whose presence is necessary for the care of the vessel.

(4) The soiled linen and personal effects of the crew and passengers, which, in the opinion of the Health Officer, may be considered as infected, shall be disinfected, in accordance with the rules contained in Appendix II.

(5) The bilge-water will be pumped out after disinfection, and good drinking-water will be substituted for the water stored on board.

(6) All parts of the ship, which have been inhabited by plague-patients, will be disinfected; and the other parts of the

ship may also be disinfected at the discretion of the Health Officer.

(7) When these rules have been fully complied with, the Health Officer shall, by an order in writing under his hand, to be delivered to the Commander, permit the yellow flag to be hauled down.

Suspected ships.

"*Rules relating to suspected ships*—

(1) If a suspected ship has, under Rule IV, been stopped at Diamond Harbour, she will await the orders of the Health Officer there. If, under Rule V, she has been brought up to Mateabrooj, the Health Officer will go on board of her there.

(2) The passengers and crew will be medically inspected by the Health Officer.

(3) The soiled linen and personal effects of the passengers and crew which, in the opinion of the Health Officer, may be considered as infected, will be disinfected in accordance with the rules contained in Appendix II.

(4) The bilge-water will be pumped out after disinfection, and good drinking-water will be substituted for the water stored on board.

(5) All parts of the ship, which have been inhabited by plague-patients, will be disinfected; and the other parts of the ship may also be disinfected at the discretion of the Health Officer.

(6) Passengers who are suspected by the Health Officer to be infected with plague may be detained under observation in an isolation hospital appointed for the purpose, for ten days from arrival of the ship, or if plague occurs among them while under observation, from the date of the last case.

(7) The crew will not be allowed to land, except on duty, for ten days from the arrival of the ship.

(8) Passengers who are passed on medical inspection as healthy will be allowed to proceed to their destination on their giving a written undertaking, in the form annexed, to submit themselves to surveillance by the Medical Officer (if any) appointed for the purpose, at their destination, for a period of ten days from the date of the arrival of the ship. The undertaking shall be executed in duplicate, and one copy shall be sent by the Health Officer to the Medical Officer concerned.

(9) When these rules have been fully complied with, the Health Officer shall, by an order in writing under his hand, to be delivered to the Commander, permit the yellow flag to be hauled down.

"*Rules relating to healthy ships*— Healthy ships.

(1) A healthy ship shall be given free *pratique* at once, whatever may be the nature of her bill of health.

(2) Such a ship may, at the discretion of the Health Officer, be subjected to the measures prescribed in Rules VIII (2), VIII (3) and VIII (4), but the ship itself may not be disinfected as in Rule VIII (5), except with the consent of the Commander or Agent.

(3) Passengers who, on medical inspection, are suspected by the Health Officer to be infected with plague, may be detained under observation in an isolation hospital appointed for the purpose, for ten days from the date on which the ship left an infected port, or, if plague occurs among them while under observation, from the date of the last case.

(4) The crew will not be allowed to land, except on duty, for ten days from the date on which the ship left an infected port.

(5) The crew and passengers may, at the discretion of the Health Officer, be subjected to surveillance in the manner described in Rule VIII (8), for a period of ten days from the date on which the ship left an infected port.

(6) When these rules have been fully complied with, the Health Officer shall, by an order in writing under his hand, to be delivered to the Commander, permit the yellow flag to be hauled down.

(7) None of the above measures will be considered necessary when the ship has been given free *pratique* at Colombo or other intermediate port."

## MADRAS.

On the 6th of July the Government of Madras issued a set of revised quarantine regulations under the Epidemic Diseases Act for all ports in the Madras Presidency. The rules were approved by the Government of India except in one particular in which they departed from the principles laid down by the Venice Convention. The necessary modification was made by the Government of Madras in Publication of revised rules for ports in the Madras Presidency.

a subsequent notification. The rules were based on the English Local Government Board Rules, which are summarized in Chapter XIV, modified so as to meet the requirements of the Venice Convention.

**Based on English Local Government Board rules and Venice Convention.**

**Classification of ships.**

In the first place the rules make the threefold classification of ships and define the terms "observation" and "surveillance" as in the Venice Convention. They then provide for the hoisting of signals and for the discharge of bilge-water outside port limits.

**Measures on arrival.**

On arrival the Port Officer detains the vessel at an appointed mooring and sends information to the Port Health Officer. The latter visits the vessel and after the necessary enquiry certifies whether it is "healthy," "suspected" or "infected." If the vessel is suspected or infected it is required to moor at the appointed anchorage.

**Examination of persons on board.**

**Treatment of the sick.**

After certifying to the classification of the vessel the Port Health Officer examines every one on board. Persons found to be suffering from plague are, if possible, landed and treated in isolation. If the vessel is infected all other persons on board are kept under "observation" or "surveillance," and must, unless stress of weather or some other cause renders it impossible, be disembarked for the purpose. If the vessel is healthy or suspected the persons disembarked must be kept under "surveillance" at their destination or at the port.

**Treatment of the healthy.**

**Observation and surveillance.**

Persons placed under surveillance must present themselves for examination at such times and places as the examining medical officer may direct. The period of observation and surveillance is that fixed by the Venice Convention, and in the case of persons disembarked from healthy ships must not exceed ten days from the date of departure of the vessel from the infected port.

**Grant of clean bill of health.**

When the prescribed precautions have been carried out a clean bill of health may be granted, in the case of infected vessels after ten days from the last case of plague, and in the case of healthy vessels after ten days from the date of departure from the infected port.

**Disinfection of vessel.**

The Port Health Officer gives directions, in accordance with the Venice Convention, for the disinfection of the vessel. The following directions are laid down for the destruction or disinfection of articles likely to be contaminated:—

**Destruction or disinfection of contaminated and suspected articles.**

"The master shall cause to be destroyed any articles on board his vessel that may have been soiled with plague discharges, and he shall also cause to be disinfected or destroyed the clothing and bedding, and other articles of personal use likely to retain infection which are on board his vessel and which have been used by any person who has suffered from plague on board such vessel, or who, having left such vessel, shall have suffered from plague during the stay of

such vessel in the port. If the master shall have neglected to do so or have done so ineffectually before the vessel arrives in port, he shall forthwith, upon the direction of the Sanitary authority or the Port Healtn Officer, cause the same to be disinfected or destroyed to the satisfaction of that authority, and in accordance with the instructions as to disinfection contained in the appendix to these regulations. If the said master neglects to comply with any such directions within a reasonable time the Sanitary authority or the Port Health Officer shall cause the same to be carried into execution at the expense of the said vessel"

Water-supply.

The water tanks of infected or suspected vessels must be emptied, cleaned and re-filled, provided facilities exist for obtaining a fresh supply. The Port Health Officer may direct the same precaution in the case of healthy vessels.

Mails and cargo.

Mails and cargo may be landed under due precautions.

Supplies.

The Port Health Officer must facilitate the conveyance, under due precautions, of provisions, etc., to vessels under detention.

## BURMA.

Draft rules for Rangoon.

The Government of Burma submitted a revised set of draft quarantine rules for the port of Rangoon with a letter dated the 8th September. The Government of India approved of the draft rules on the 28th of this month.

Based on the Bengal Rules.

The Rangoon draft rules were based on those issued by the Government of Bengal for the port of Calcutta, with a few slight modifications. Amongst other modifications the Government of Burma introduced a definition of the term "infected port" which it defined to mean "Bombay or Goa." The Government of India stated in the letter of the 28th September that it appeared to them hardly necessary to introduce a definition of the term "infected port," since the Local Government could at any time issue instructions to its officers stating the ports that should be treated as infected. If, however, the Government of Burma preferred to retain a definition of the term, the Government of India thought that the definition should be one of general applications, and not limited to meet the circumstance of the existing case. They suggested that the definition might be altered to the following :—

Definition of infected port.

"*Infected port* means any port which the Government of Burma may declare to be infected."

Publication of revised rules for Burma ports.

On the 7th of October the Government of Burma issued notifications under the Epidemic Diseases Act introducing the new rules at

the Ports of Rangoon, Akyab, Moulmein, and Bassein, and a subsidiary notification declaring Bombay and Goa to be infected ports. At the same time a notification was issued under the Quarantine Act cancelling the rules which were at the time in force.

## Regulations for inspection of outward bound Vessels based on the Venice Convention.

### INSTRUCTIONS OF THE GOVERNMENT OF INDIA.

In the circular of the 1st June forwarding the Venice Convention to the Maritime Local Governments the following instructions were given with regard to the inspection of the outward bound sea traffic :—

Inspection to be conducted exactly as prescribed in the Venice Convention

"In order that the obligations imposed by the Convention may be fulfilled at an infected port it is essential that the medical inspection and disinfection should be conducted exactly in the manner prescribed by the regulations and summarized above. The Government of India consider that it is also desirable that all non-professional attendants and relatives of any persons, who on examination appear to be suffering from plague, shall be prevented from embarking. If after the medical examination has been completed and all the passengers and crew are on board, a case of plague occurs, the patient and his non-professional attendants and relations must be landed and isolated on the first opportunity. The ship will then become an infected vessel within the definition given below in paragraph 7. Although the ports of Madras and Calcutta are not infected, the Local Governments have, with the approval of the Government of India, made the special rules for medical inspection referred to above, and, in the opinion of the Governor General in Council, it is desirable that they should be assimilated, in the case of vessels sailing for ports out of India, as far as possible to those which will, under the terms of the Convention, have to be adopted at the infected ports of the Bombay Presidency."

### BOMBAY.

Draft rules for the Port of Bombay.

With their letter of the 22nd of July the Government of Bombay forward a set of draft rules, based on the then existing rules and the Venice Convention, for the examination of outward-bound vessels sailing from the port of Bombay. The provisions of the draft rules were briefly as follows :—

Substance of rules.

No vessel may leave the port until she has been inspected by the Health Officer, and a certificate given that the officers, crew, and

passengers are free from plague. If the vessel only touches at Bombay *en route* from some other port the inspection may be limited to the examination of the persons embarking, the fact that they are free from plague being certified on an endorsement to the bill of health. If an ascertained or suspected case of plague is discovered the bill of health may not be granted until the sufferer, together with his attendants and relatives, and their baggage and personal effects, have been removed from the vessel, and the vessel has been disinfected in such manner as the Health Officer directs; the removal and disinfection to be noted in the bill of health. The baggage and effects of the person removed or prevented from sailing to be disinfected on shore. After the bill of health has been granted, no person or cargo may be embarked or disembarked unless the vessel is again inspected, and re-inspection is also required if the vessel does not leave port before 6 A.M. of the day following the first inspection. Port clearance may not be delivered until the bill of health is produced. The medical inspection must be carried out between sunrise and sunset. Plague cases removed from the vessel must be isolated, and persons removed as suspicious may be kept under observation.

Inspection on board and on shore.

It will be observed that these draft rules do not follow the Venice Convention in the one particular that they authorise inspection on the ship as well as on shore. The advisers of the Government of Bombay pointed out that there are very grave obstacles to the examination on shore of all persons sailing, and the Governor in Council accepting this view asked that the Convention might be so modified as to allow of inspection on shore or on board, as the circumstances of any particular port might render necessary. After a careful consideration of the subject, the Government of India were constrained to accept the opinion of the Government of Bombay and their advisers, and to authorise the continuance of the practice hitherto adopted at the port of Bombay, under which the examination is made on board or on shore as may be convenient. In arriving at this conclusion the Governor General in Council was specially influenced by the following considerations. The advisers of the Government of Bombay pointed out that the most important portion of the examination is the examination of the crew, firstly because of the persons examined the greater number belong to crew of vessels, and secondly because experience has shown that the crews are much more likely to be infected than the passengers. In the case of the crew it is practically impossible to examine the men all on shore, and in the less important case of the passengers, though it is possible, it would give rise to very serious inconvenience both to the passengers and to the regular

Inspection on shore not made obligatory at Bombay.

working of the port arrangements. The difficulties are mainly due to the wide extent of the port. The large bulk of shipping which is always present in the harbour is scattered amongst numerous moorings and berths extending over an area of many miles. The crews often go on board some days before the vessel starts, and when the vessel lies a long way from the wharfs to bring the crews on shore for inspection would, if practicable arrangements could be made for the purpose, entail great trouble, expense and delay. It was also represented that police surveillance over the scattered shipping would be so difficult that satisfactory arrangements could not be made to prevent the passengers and crew from exposing themselves to the risk of infection after the examination on shore, since a whole night would often elapse between the examination and the departure of the vessel. Lastly, the Government of India attached particular importance to the great success that had attended the examination under the arrangements hitherto prescribed by the Government of Bombay, and they considered this success to be the strongest argument that could be urged for the continuance of those arrangements.

**Mention of plague cases discovered on board in the bill of health.**

The Government of India at the same time pointed out that if inspection on board resulted in the discovery of a case of plague the ship became infected within the meaning of the Venice Convention, and that the fact must therefore be stated in the bill of health. "The adoption of the prescribed precautions on the occurrence of a case before departure cannot alter the fact that the vessel is infected. It is stated by Dr. MacCartie that during the height of the epidemic, it was generally found necessary to remove some of the crew on suspicion, and that in some instances the suspected cases turned out to be true cases of plague. It does not appear necessary to mention in the bill of health the removal of a case on mere suspicion, for instance the removal of a person suffering from fever without any other sign of plague. But if at the time of inspection on board a case is discovered which is ascertained or believed to be plague, then it is clearly necessary to mention the fact in the bill of health. In such cases the precautions adopted should also be stated, including, if the patient has been living on board, the disinfection of the infected part of the vessel."

**Other matters.**

Apart from the matters discussed above the draft rules appeared to the Government of India to be generally suitable and in accordance with the Venice Convention. They made the following additional observations with regard to them: "It should be stated in Rule I, in accordance with the terms of the Convention, that the Health Officer must examine each person sailing on the ship,

and that the Consular authority interested in the ship may be present at the examination. In the case of vessels touching at the port of Bombay for the purpose of embarking passengers, for which provision is made in Rule I, the inspection should, in the opinion of the Government of India, be made on shore, and they consider that this should be stated in the rule. It also appears from Sir James Campbell's letter of the 24th June that under present arrangements passengers are sometimes examined on shore. The rules should provide that in such cases persons suffering, or suspected to be suffering, from plague, and their relatives and attendants, should not be permitted to embark."

## BENGAL.

Draft rules for ports in Bengal.

On the 17th July, the Government of Bengal forwarded a set of revised draft rules for vessels sailing from ports in Bengal for ports out of India. The rules were framed in accordance with the Venice Convention and made examination on shore compulsory in the case of everyone sailing on the vessel. At the same time the Government of Bengal stated that, owing to the peculiar conditions of the Port of Calcutta, which stretches along the bank of a tidal river at all times difficult of navigation, it was difficult to arrange for examination on shore without occasioning inconvenience, and possibly causing steamers to miss a tide. As it had been found impossible to comply literally with the requirement of the Convention at the infected port of Bombay, the Government of India did not consider it necessary to press for compliance in the case of the uninfected port of Calcutta, and they therefore authorised the continuance at that port of the more convenient procedure of examination on board. It was at the same time pointed out that if a case of plague is discovered on board during the inspection, the ship becomes infected and the fact must be stated in the bill of health together with the precautions taken.

Difficulty of examination on shore.

Examination on board authorised.

Mention of cases discovered on board in the bill of health.

Issue of modified rule by the Government of Bengal.

On the receipt of these instructions the Government of Bengal issued, on the 17th August, a modified set of rules for vessels sailing from Calcutta, Chittagong, Balasore, Chandbally, False Point, and Puri for ports out of Europe. The substance of these rules is briefly as follows.

Substance of rules.

No vessel may leave the port until it has been inspected and a bill of health has been granted by the Health Officer stating that the officers, crew and passengers were examined by him at the time of embarkation, and are free from plague. In the

case of passengers a certificate by a Commissioned Medical Officer appointed for the purpose, dated not more than twelve hours before the departure of the vessel, may be accepted in lieu of examination by the Port Health Officer.

If a case, ascertained or believed the plague, is discovered during the course of the inspection, the sufferer and his relatives and non-medical attendants must be removed from the vessel and segregated on shore. The infected parts of the vessel must be disinfected, and the occurrence and the precautionary measures adopted must be stated in the bill of health.

All contaminated and suspected articles must be disinfected on shore or in a disinfection lighter. After the grant of the bill of health no person may be admitted on board unless there is a fresh inspection. Port clearance may not be delivered until the bill of health has been granted, provided that the Collector of Customs may grant port clearance under section 66 of the Sea Customs Act on a guarantee being given by the agents of a vessel that within forty-eight hours of departure they will produce a duplicate copy of the bill of health as finally granted, signed by the Port Health Officer or an additional Port Health Officer, and that if for any reason the Health Officer should refuse to grant the bill of health, they will bring the vessel back to its moorings.

## MADRAS.

**Vessels using ports in the Madras Presidency as ports of call.**

The Government of Madras enquired on the 6th of July whether in the case of a vessel starting from, say, Calcutta, and calling at Madras or any other port in the Madras Presidency on its way home, the crew and passengers already on board need be brought on shore and inspected there. The Government of India replied that only the persons who join the vessels at Madras or other port of call need be inspected.

**Revised rules issued by the Government of Madras.**

The Government of Madras issued their revised rules for the inspection of vessels sailing from ports in the Madras Presidency for ports out of India on the 11th of September. They followed the lines of the draft Bombay rules.

**Residents of infected localities.**

The first rule repeated the provisions of the previous Madras regulations that no person may embark who has within the preceding ten days resided in a part of India believed to be infected with plague.

**Labourers sailing from Tuticorin to Colombo.**

The second rule repeated the existing prohibition against deck passengers belonging to the labouring classes sailing from Tuticorin to Ceylon without a certificate from the officer appointed for the purpose by the Colonial Government.

General substance of rules.

The regulation then goes on to cite the rules about the grant of the bill of health; the individual examination of all persons sailing on board by day at the time of embarkation; the disembarkation of persons ascertained or believed to be suffering from plague, together with the attendants and relatives of such persons; the disinfection of their effects and of the infected portions of the vessel; the mention of the plague case and the precautions in the bill of health, etc. The rules provide that the medical examination must be made on shore, except that in the case of vessels anchored in the Madras roadstead (*i.e.*, outside the enclosed harbour), and at minor ports, the inspection of the officers and crew may be conducted on board.

Examination on board and on shore.

Remarks by the Government of India.

The Government of India stated that the rules appeared to be in general well adapted to meet the circumstances of the case. They considered, however, that the Venice Convention having been commonly accepted and enforced, the retention of the rule prohibiting the embarkation of persons coming recently from an infected locality was unnecessary. At the same time it was recognized that the case of Ceylon was peculiar owing to its close proximity to the Indian mainland, and it was stated that if the Government of Madras considered that the withdrawal of the rule in the case of vessels bound for Ceylon would be likely to cause vessels from Madras ports to be put in quarantine at Colombo, the rule might be retained in that special case.

Passengers from infected localities.

Special case of Ceylon.

Examination on shore.

It was further pointed out that the rules did not prescribe that in the event of the examination being made on shore the sick person and his relatives and attendants should not be prevented to embark.

Application of the rules to vessels sailing for Burma.

Lastly, it was mentioned that although the rules apparently were to apply to vessels sailing for Burma, this was not stated in the preamble which purported to confine the operations of the rules to vessels sailing for ports out of India.

## Emigration.

Prohibition of emigration from the infected area.

In March 1897 it was considered desirable, for the protection of British Colonies and other countries, to prohibit intending emigrants from the infected area from leaving India. The following notification was therefore issued by the Government of India on the 6th March:—

"In exercise of the powers conferred by section 2, sub-section (1) of the Epidemic Diseases, Act (III of 1897), the Governor General in Council is pleased to direct that no person who has, since the 1st

January 1897, resided or been in, or passed through, the territories administered by the Governor of Bombay in Council, or the State of Baroda or the territories of any Native Prince or State under the suzerainty of Her Majesty exercised through the Governor of Bombay in Council, shall, until further orders, be permitted to embark on any ship at any port in British India with the object of proceeding as an emigrant or as a labourer to any port out of British India."

When Sind became free from plague and Karachi became a healthy port the prohibition was withdrawn in so far as it applied to Sind.

# CHAPTER XII.

## MEASURES TO PREVENT THE SPREAD OF INFECTION BY MERCHANDISE AND FOOD-STUFFS.

### Orders of the Government of India forbidding the import of Susceptible Articles from the Infected Area.

Objects soiled with the excreta of patients, a dangerous source of infection.

Objects soiled by the excreta of patients are, it has been stated, a dangerous source of infection. It was therefore considered necessary to prohibit the import from the infected area into other parts of India of articles which from their nature or use were likely to have come into contact with persons suffering from plague. In Chapter X an account has been given of the measures adopted to prevent the spread of infection by contaminated articles carried in the baggage of travellers. In addition orders were from time to time issued prohibiting the carriage, as merchandise or in any other form, from the Bombay Presidency and Sind into other parts of India of articles likely to be contaminated.

Orders prohibiting the export of susceptible articles from the Bombay Presidency and Sind into other parts of India.

There is some traffic in rags and second-hand clothing from the west of India and especially from the port of Bombay. The stoppage of this trade was an essential precaution, and the Government of India issued orders, on the 22nd of January, under the Sea Customs Act, 1878, prohibiting the import by sea of rags and second-hand clothing from Bombay and Karachi to Calcutta, Madras, and Rangoon. On the 17th February a wider notification was issued by the Government of India under the Epidemic Diseases Act. It prohibited the bringing of rags, used apparel and bedding (except when carried in the baggage of travellers), waste paper and used gunny bags, from all infected ports to any other port in British India. On the 22nd

March a further notification was issued prohibiting, in general terms, the bringing of the same articles from the Bombay Presidency and Sind into any other part of British India. On the 3rd of April the prohibition was extended to all territories in India which are under the administration of the Governor General in Council, but do not form part of British India. Similar prohibitory orders were issued by the Hyderabad, Kathiawar, Cochin, and Travancore States.

## Regulations with respect to Rags, etc., issued by Local Governments.

Madras.

Some of the Local Governments issued special regulations to guard against the spread of infection from rags and other susceptible articles. The Madras rules provide that the President of the Municipality may disinfect or destroy any collection of rags in rag-pickers' houses and rag stores, or of second-hand gunny bags imported from any infected locality.

Bengal.

The regulations for Calcutta and other municipalities in Bengal contain a similar rule with respect to rags, and provide also that no person, except the servants of the municipality, shall pick up rags or other refuse in the streets or elsewhere, and that rags and other refuse shall not be transported except under conditions prescribed by the Health Officer.

General North-Western Provinces rule with respect to the packing of goods from infected localities.

Regulations of the same nature were framed by the Government of the North-Western Provinces and Oudh. That Government also framed a general rule with respect to goods consigned from and believed to have been packed in the infected area. Such goods may be detained for examination before entry into any municipality or cantonment, and the materials used in packing, such as rags, straw, grass, paper, etc., may be destroyed if they are considered likely to convey infection.

## Treatment of Susceptible Articles in the Venice Convention.

The question of the treatment of goods from infected countries was one of the most important matters discussed at the Venice Sanitary Conference.

List of "susceptible" articles in the Venice Convention.

The following is the list of articles and goods which the Conference classed as "susceptible":—

"1. Used linen, clothing, personal effects and bedding.

When these articles are carried as baggage, or in consequence of a change of abode (household goods) they are subjected to special treatment.

Soldiers' and sailors' kits, returned to their country, after their death, should be treated in the same way as the articles named above.

"2. Rags, not excepting rags compressed by hydraulic force, which are carried as merchandise in bales.

"3. Old sacking, carpets and old embroidery.

"4. Raw hides, untanned and fresh skins.

"5. Animal refuse, claws, hoofs, horsehair, hair of animals generally, raw silk and wool.

"6. Human hair."

Reasons for including the different articles in the list.

The articles contained in this list fall into two classes. The articles numbered 1, 2 and 3 were included in the list because their nature or use make it likely that they may have been in contact with persons suffering from the disease and may therefore have become contaminated. The articles numbered 4 to 6 were included because they are derived from man, or from animals which it was considered possible might be subject to plague infection. It has been stated elsewhere the necessity for this precaution is at least doubtful.

Treatment of susceptible articles prescribed by the Venice Convention. The prohibition against import is only optional.

The regulations prescribed by the Venice Convention (Chapter II, section IV) direct that the import of articles included in the susceptible list may be prohibited by the Government concerned. The prohibition is optional and it is not compulsory to forbid the entry of goods or articles of any class. The only articles which must of necessity be subjected on arrival to any precautionary measures, such as disinfection, are clothing, bedding and similar articles which have been actually worn or used, and which are carried as ordinary baggage, if they have been brought from an infected area, and are considered by the local sanitary authority as likely to be contaminated. The disinfection of merchandise may be enforced only if the local sanitary authority considers it to be contaminated, or if it falls under any of the heads of the susceptible list. The treatment accorded by the Governments of other countries to goods arriving from India during the period of the plague is described in the next chapter.

Reasons why the Government of India did not issue any further prohibitory orders with respect to the transport of susceptible articles.

The Government of India considered that the orders that they had already issued forbidding the import from the Bombay Presidency and Sind into other parts of India of used apparel and bedding, rags, waste paper, and used gunny bags were sufficient to meet the requirements of the case, and that it was not necessary for the purpose of protecting the rest of India to prohibit the import from the infected area of any of the other articles on the susceptible list.

In reciting the obligation imposed on the countries which are parties to the Venice Convention to confine their precautionary measures to goods coming from the infected local area, it is stated in Chapter II, section III of the Regulations, that this obligation only exists on the express understanding that the Government of the infected country takes the necessary measures to prevent the exportation of susceptible articles derived from the infected area. In other words, a foreign government would be a liberty to decline to receive articles classed as susceptible coming from a clean port unless measures were taken in India to prevent the exportation from that port of susceptible articles coming from the infected area. The orders contained in the notification issued by the Government of India, in February and March, alluded to above, only partly fulfil this condition since they only refer to used apparel and bedding, rags, waste paper, and used gunny bags. All foreign governments did not, however, avail themselves of the option of prohibiting the import of all the articles classed as susceptible even from Bombay itself.

In view of this circumstance and in view of the optional nature of the regulation, the Government of India did not think it necessary to issue orders in addition to the orders of February and March, with the view of prohibiting the exportation from clean ports of articles included in the "susceptible" list and coming from the Bombay Presidency and Sind. But the Governments of Madras, Bengal, and Burma were informed that if, after consulting the mercantile community, they considered that prohibitive orders should issue with regard to all or any of the susceptible articles, the Government of India would be prepared to consider proposals with this object. No such proposals were made.

## Precautionary Measures with regard to Food-stuffs.

**Fear that plague infection might be brought from Sind into the Punjab in grain or other food-stuffs.**

Early in the month of March when plague broke out in Sukkur the Government of the Punjab expressed a fear that infection might be carried from Sind in grain. In ordinary years there is not a large trade in food grain from Sind to the Punjab. The trade generally flows the other way, the Punjab sending large quantities of wheat to Karachi for shipment to Europe. But in the season of 1896-97 the current of trade was reversed, the crops in Sind, where the inundation was good, having been sufficient to afford relief to the south-eastern districts of the Punjab which were the scene of scarcity. To have prohibited the import of grain from Sind would therefore have entailed serious consequences.

Grain a possible source of infection.

Grain and other food-stuffs are no doubt a possible source of infection, and in the case of grain the danger is to some extent increased by the great susceptibility of rats to plague. But the Government of India did not consider that the danger was sufficient to make it necessary to prohibit the exportation of grain from Sind, and they believed that whatever danger did exist might be obviated by the adoption of careful precautions. Such precautions were carried out immediately and with great thoroughness. The Government of India issued instructions to the effect that measures should be adopted to obtain immediate information of any plague cases in or near grain godowns and to prevent the removal of grain open to the suspicion of being contaminated. The Commissioner in Sind repeated these instructions to all district officers and likewise directed them to detain grain in any way suspected and to examine grain godowns for rats. In Sukkur one case was discovered in a grain godown, and the grain was removed and burnt.

Prohibition of the export not considered necessary. Careful precautions prescribed and carried out.

Orders were subsequently issued prohibiting the exportation of grain from the infected portions of the city of Karachi. A special inspecting staff was formed in all infected towns to examine grain godowns and bakeries, to direct their cleansing, and to cause all other necessary precautions to be adopted.

In so far as is known no case of plague was occasioned by grain or other food-stuffs imported from an infected locality.

Precautionary measures in the city of Bombay.

The following account of the precautions adopted in the city of Bombay to prevent the sale of contaminated grain and other food-stuffs and merchandise is from the report written by Mr. Snow, the Municipal Commissioner:—

"The condition of the grain godowns on the Port Trust Estate attracted early attention, as it was found that numerous cases of plague were occurring in the dwelling-rooms above them. Interference with these warehouses was a matter which demanded very careful consideration, but the sanitary interests of the city were all important and in every instance where a case of plague was known to have occurred above a godown, the place was closed for twenty days, the grain and other merchandise were taken out and exposed to the sun in charge of ramosis,* sulphur was freely burnt inside and outside the building, and the godowns themselves thoroughly flushed and disinfected.

"Similarly, in the case of shops, when a case occurred, no goods were allowed to be sold till they had been exposed to the sun for at least a day. The shops were not allowed to be used till they had

* Watchmen.

been shut up and completely fumigated for three days, and even then had to be limewashed before they were allowed to be re-occupied.

"Two hundred and twenty-five godowns and one hundred and thirty-seven shops were treated in this drastic manner. At the same time large quantities of infected or damaged sweetmeats and other food preparations were destroyed, and many tons of grain sweepings were found which had been collected from the streets and gullies for the purposes of adulterating sound grain. From one godown as much as 51 cart-loads of these sweepings were taken away and incinerated."

# CHAPTER XIII.

## STAFF.

### Preliminary Remarks.

It is desirable, especially with a view to future reference, to say a few words regarding the large medical and military staffs employed in the plague operations, and the special remuneration which was granted to them. The medical staff will first be noticed, then the military staff, and lastly a few points connected with some kindred subjects.

### Medical Staff.

The following is a tabular statement of the medical officers and subordinates employed by the Government exclusively on plague duty and of the manner in which they were recruited :— Tabular statement of staff.

| Province in which employed. | Withdrawn from military duty. | | | | Transferred from permanent civil employment. | | | | | Retired sub-ordinates. | | Sent from England. | | Private Practitioners. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Indian Medical Service Officers. | Army Medical Staff Officers. | Military Assistant Surgeons. | Military Hospital Assistants. | Indian Medical Service Officers. | Military Assistant Surgeons. | Civil Assistant Surgeons | Military Hospital Assistants | Civil Hospital Assistants. | Military Assistant Surgeons. | Civil Hospital Assistants. | Army Medical Staff. | Colonial Medical Service. | |
| Bombay ... ... | 11 | 14 | 14 | 12 | 8 | ... | 14 | ... | 97 | 3 | ... | 3 | 1 | 2 |
| Madras ... ... | 2 | ... | ... | ... | 1 | ... | 5 | ... | 11 | ... | ... | ... | ... | 1 |
| Central Provinces ... | 2 | ... | ... | 1 | ... | ... | 4 | ... | 4 | ... | ... | ... | ... | ... |
| Bengal ... ... | ... | .. | ... | ... | 1 | 2 | 2 | ... | 3 | ... | ... | ... | ... | ... |
| North-Western Provinces | 9 | 5 | 4 | 8 | ... | ... | 4 | ... | 13 | 1 | 2 | ... | ... | 5 |
| Punjab ... ... | ... | ... | ... | ... | 3 | 4 | 7 | 14 | 35 | ... | ... | ... | ... | ... |
| Rajputana ... ... | 3 | ... | 1 | 5 | ... | ... | ... | ... | 3 | ... | ... | ... | ... | 1 |
| Central India ... | ... | ... | ... | 1 | 1 | ... | ... | ... | 1 | 1 | ... | ... | ... | 1 |
| Baluchistan ... ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Burma ... ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 9 |
| Total ... | 27 | 20 | 20 | 27 | 14 | 6 | 36 | 14 | 167 | 5 | 2 | 3 | 1 | 19 |

Strain on the Medical Service.

It will be seen from this statement that the staff included 64 Commissioned Medical Officers, 66 Assistant Surgeons, and 210 Hospital Assistants. The strain on the medical services occasioned by the withdrawal of so large a number of officers from their ordinary duties was very great and was increased by the fact that some medical officers and many medical subordinates were at the same time required for famine duty. An endeavour was made to relieve the strain as far as possible by the employment of volunteers from the Army Medical Staff, retired subordinate officers, and private practitioners.

Private practitioners

In addition to the private practitioners shown in the statement as employed exclusively on plague duty, a considerable number of medical gentlemen in the Bombay Presidency rendered invaluable assistance by supervising private hospitals, and in other ways.

Staff at the time of the recrudescence.

The statement refers to the staff employed during the first outbreak, *i.e.*, up to the month of July. On the occurrence of the recrudescence matters were greatly complicated by the large demand for medical officers and subordinates for the field hospitals on the North-West Frontier. The difficulty was met as far as possible by economising civil officers to the utmost degrees by employing more private practitioners, and by procuring more officers from England.

Excellent work of the Medical Staff.

The zeal and devotion displayed by the medical staff in the performance of their duties reflect high credit on the services to which they belong.

Special remuneration.

It was recognised that the specially arduous, and to some extent hazardous, nature of the duties rendered it fitting that officers and subordinates should be granted some extra remuneration, and that volunteers could not reasonably be expected to come forward without the offer of fairly liberal terms.

Account of the orders granting special remuneration.

The following is a brief account of the orders passed with regard to the remuneration of the different classes of medical officers and subordinates :—

*Commissioned Medical Officers of the Indian Medical Service.*—In Circular letter No. $\frac{7\text{-Sanitary}}{630\ 64}$, dated the 20th February, Local Governments were informed that officers of the Indian Medical Service deputed on plague duty might be permitted to draw allowances at the rates laid down for officers deputed to famine work in Article 101 of the Civil Service Regulations. These rates are: (i) if the officer is transferred from military duty, Rs. 300 a month if the officer's service is more than five years, and Rs. 200 a month for officers of less service; (ii) if the officer is withdrawn from civil employ, Rs. 5 a day. Subsequently it was explained (Circular

No. $\frac{12\text{-Sanitary}}{1218-1224}$, dated the 7th April 1897) that, notwithstanding the provisions of Article 101 of the Civil Service Regulations, the allowance might be drawn by officers deputed to plague duty within the provinces in which they were serving at the time of their deputation.

In Calcutta an allowance of Rs. 150 a month was granted to the Additional Port Health Officers who performed the arduous work of examining vessels in addition to their own duties.

*Commissioned Medical Officers of the Army Medical Staff.*—In letter No. 594-Sanitary, dated the 19th February, the Government of India sanctioned the employment of volunteers from the Army Medical Staff on a special allowance of Rs. 300 a month in addition to Indian pay and allowances.

*Commissioned Medical Officers sent from England.*—Three officers of the Army Medical Staff and Dr. Lowson of the Colonial Medical Service, who had had experience of plague in Hong-kong, were sent to Bombay by the Secretary of State. The salaries of the Army Medical Staff Officers were fixed by the Secretary of State at £2 a day in addition to their English pay and allowances, and travelling allowances at the rates laid down in the Indian Regulations. Dr. Lowson's remuneration was fixed specially.

*Uncovenanted Medical Officers.*—In January 1898, the Government of India sanctioned the grant to Uncovenanted Medical Officers who, at the time of their deputation to plague duty were discharging the duties of Civil Surgeons, of a special allowance at the same rate as is admissible to an officer of the Indian Medical Service in civil employ, *i.e.*, Rs. 5 a day

*Applicants for employment in the Uncovenanted Medical Service.*—The employment of applicants for appointments in the Uncovenanted Medical Service on a salary of Rs. 350 a month was sanctioned in a letter to the Director General, Indian Medical Service, No. 278, dated the 9th April. In a later letter (No. 372, dated the 26th April), the Director General was informed that the officers selected might be granted travelling allowance to and from the places to which they were posted at the rates of double second class fares for journeys by rail, and four annas a mile for journeys by road.

*Civil Assistant Surgeons*—On the 29th March (Circular No. $\frac{11\text{-Sanitary}}{1154\ \ 1160}$) the Government of India sanctioned the grant of a deputation allowance of Rs. 2 a day to Civil Assistant Surgeons employed on plague duty. At the request of the Government of Bombay, it was

**decided in September that retrospective effect should not be given to this order in the case of those Assistant Surgeons who had been granted an allowance of Rs. 100 a month by the Bombay Municipality.**

In a letter to the Director General, Indian Medical Service, No. 496, dated the 19th May, the Government of India sanctioned the employment of persons of the Civil Assistant Surgeon class, at the following rates of remuneration :—

(*a*) Pay at the rate of Rs. 100 a month.

(*b*) Special allowance of Rs. 2 a day.

(*c*) Travelling allowance to and from the place to which the officer was posted.

*Military Assistant Surgeons.*—In a letter (No. 236, dated the 20th March) addressed to the Director General, Indian Medical Service, the Government of India sanctioned the grant of daily deputation allowance to Military Assistant Surgeons employed on plague duty at the following rates :—

| | Rs. |
|---|---|
| On pay exceeding Rs. 150 ... ... ... | 3 |
| On pay not exceeding Rs. 150 ... ... ... | 2 |

It was subsequently represented that these allowances were inadequate, since the officers would receive little or no extra remuneration if they lost the charge or other special allowances which they were drawing at the time of their deputation. Accordingly, in the month of August the Government of India stated that the Assistant Surgeons should be entitled to receive, in addition to the deputation allowance, any acting, or charge, or house allowance, which they were drawing at the time of their deputation, and which they would have continued to draw but for the deputation.

*Retired Military Assistant Surgeons.*—The temporary employment of retired Military Assistant Surgeons for plague duty was sanctioned by orders contained in letter No. 548, dated the 18th February 1897, to the Director General, Indian Medial Service, on the condition that candidates should present a medical certificate of physical fitness. The officers so appointed were to be allowed the pay of their grade at the time of retirement, with an allowance of Rs. 100 a month, provided that their salary, inclusive of pension, did not exceed a maximum of Rs. 350 a month. The Director General, Indian Medical Service, subsequently represented that some of these medical subordinates were very experienced officers and before retirement had been in receipt, as Civil Medical Officers, of Rs. 700

a month besides Jail and other allowances, and that they received pensions of Rs. 200 a month. The extra Rs. 150 a month would, therefore, not be a sufficient inducement to them to undertake the hard work which plague and famine duty involved. The suggestion of the Director General, Indian Medical Service, that Local Governments and Administrations should be authorised to raise the limit to Rs. 500 a month in special cases, was accepted by the Government of India, and orders were issued accordingly in circular letter No. 339—48, dated the 21st April 1897.

*Civil Hospital Assistants.*—The Government of India sanctioned the grant of an allowance of annas 8 a day to Civil Hospital Assistants employed on plague duty in a circular letter of the 29th March (No. $\frac{11\text{-Sanitary}}{1154-1160}$). In the case of Madras Hospital Assistants, the Local Government considered that an allowance of Rs. 10 a month was sufficient, and in an order of the 5th February they had sanctioned payment at this rate. The matter was left to the discretion of the Government of Madras.

In May the Government of Bombay represented that until the issue of the orders of the Government of India on the subject, Hospital Assistants employed on plague duty in that Presidency had been permitted to draw an allowance of Rs. 25 a month. The question whether the allowance of annas 8 a day should be increased was then considered, and the Director General, Indian Medical Service, expressed the opinion that the Hospital Assistants who had been most strenuous and fearless in the discharge of their duty were entitled to a higher remuneration than those who had performed their duties without showing particular zeal. The Government of India, while recognising the necessity of giving some extra remuneration in addition to that already sanctioned to the Hospital Assistants employed in Bombay, were at first disposed to think that the additional remuneration should not be in the shape of enhanced monthly allowances, especially since the epidemic appeared at that time to have practically come to an end. It was the opinion of the Government of India that the most appropriate way to reward the more deserving Hospital Assistants in the Bombay Presidency would be to grant them a lump sum by way of bonus. The Government of Bombay considered, however, that there would be great practical difficulties in making distinctions between the value of the services of different men, and if all were to be treated on the same footing and all were to be given remuneration, which the Governor in Council believed to have been earned, there would be no advantage in calling the payment a bonus. Moreover, it was pointed out that the bonus would not be payable until the conclusion of the plague duty, whereas if the allowances were

increased the officers would have the advantage of drawing it month by month. In view of these reasons, and also in view of the facts that an allowance of Rs. 25 a month had been drawn under the orders of the Government of Bombay, before the rates had been fixed by the Government of India, and that the plague had not ceased, the Government of India in September 1897, accepted the proposal of the Government of Bombay, and sanctioned the payment of an allowance of Rs. 25 a month to all Hospital Assistants employed on plague duty in the Bombay Presidency.

*Military Hospital Assistants.*—In letter No. 236, dated the 25th March, to the Director General, Indian Medical Service, the Government of India sanctioned a daily deputation allowance of annas 8 to Military Hospital Assistants employed on plague duty. As in the case of Civil Hospital Assistants, the officers employed in the Bombay Presidency were granted Rs. 25 a month instead of the lower rate.

Military Hospital Assistants were permitted to draw, in addition to the deputation allowance, grain compensation allowance under the Indian Army Regulations, Volume I, Part II (letter No. 455, dated the 11th May).

## Military Staff.

**Work of the Military staff.**

The utility of the special work done by the military in various plague centres in the Bombay Presidency and the zealous and satisfactory manner in which that duty was performed have been described in previous chapters of this report.

**Sanitary and guard duty.**

The duties performed by the military were classed by the Government of India into two main divisions: (*a*) *Sanitary duty, i.e.*, disinfecting, scavenging, superintending, and house-to-house visitation; and (*b*) *Guard duty.*

**Tabular statement of the Military staff.**

The following statement shows the total force employed:—

*On sanitary duty.*

| | British Army. | Native Army. | TOTAL. |
|---|---|---|---|
| British Officers ... ... ... | 26 | 19 | 45 |
| Native Officers ... ... ... | ... | 16 | 16 |
| Non-Commissioned Officers and men ... | 579 | 1,038 | 1,617 |
| TOTAL ... | ... | ... | 1,678 |

*On Guard Duty.*

| | |
|---|---|
| Native Officers ... ... ... ... ... | 5 |
| Non-Commissioned Officers and men ... ... ... | 571 |
| TOTAL ... | 576 |
| GRAND TOTAL ... | 2,254 |

All these troops were employed in the Bombay Presidency with the exception of a few men employed on guard duty at the railway inspection station of Sibi in Baluchistan.

The Bombay Government at first sanctioned rates of pay which differed in different parts of the Presidency for these troops. Subsequently the whole matter was considered by the Government of India, who issued General Orders on the subject to the Government of Bombay (letter No. 673, dated the 26th June). A copy of these orders was forwarded to other Local Governments and Administrations. The following was the substance of the orders :— Remuneration of the Military Staff.

Guard duty being an ordinary military duty which any body of troops may be called upon to carry out, the Governor General in Council was of opinion that no allowances were admissible for its performance.

Sanitary duty, on the other hand, was considered to be an unusual one and to be disagreeable and dangerous. His Excellency in Council was therefore of opinion that the officers and men who had been called upon to execute it should receive adequate remuneration. In those cases where the same troops were occupied on both sorts of duties at the same time, it was left to the discretion of the Local Government to decide, on the merits of the case, whether or not the allowances should be granted.

The following allowances were sanctioned for the performance of sanitary duties :—

(1) Combatant British officers—the same rate as that admissible to officers employed on famine duty under Article 101 of the Civil Service Regulations, namely, Rs. 300 a month for officers of over five years' service, and Rs. 200 a month for officers of under five years' service.

(2) British non-commissioned officers—Re. 1 a day and 6 annas a day extra ration money.*

(3) British privates—12 annas a day and 6 annas a day extra ration money.

* The extra ration money was granted under a later order.

(4) Native officers—Re. 1-8 a day.

(5) Native non-commissioned officers—12 annas a day.

(6) Sepoys—8 annas a day.

It was directed that, from the date of issue of these orders, allowances at the above rates were to be substituted for the allowances which were being paid under the orders of the Government of Bombay. In cases where no allowances had hitherto been paid, these orders were applied retrospectively with effect from the date on which the troops were employed on sanitary duty.

In August 1897, on the representation of the Government of Bombay, the Government of India confirmed the orders of the Local Government of June 1897, sanctioning the payment of compensation for wear and tear of clothing to the British and Native troops and transport followers employed on plague duty in Bombay, at the following rates per man :—

| | Rs. |
|---|---|
| British troops ... ... ... ... | 15 |
| Native ,, ... ... ... ... ... | 10 |
| Transport followers ... ... ... ... | 5 |

## Grant of Conveyance Allowances.

In some cases the execution of plague duties in particular localities entailed a considerable amount of moving about within a small area and necessitated the maintenance of equipage or the frequent hiring of vehicles. To repay the officers for the expenditure thus incurred, conveyance allowances were from time to time sanctioned. The following is a list of conveyances sanctioned by the Government of India during the first period of the epidemic :—

| Officers. | Monthly allowance. |
|---|---|
| | Rs. |
| Military Member of the Poona Plague Committee ... | 100 |
| Deputy Sanitary Commissioner, Bombay ... ... | 100 |
| City Magistrate, Poona ... ... ... ... | 50 |
| Special Plague Mamlatdar, Poona District ... ... | 45 |

Staff of the establishment of the Health Officer of the Port of Bombay—

| | |
|---|---|
| Health Officers... ... ... ... ... | 75 |
| Additional Health Officers ... ... ... ... | 75 |
| Commissioned Medical Officers ... ... ... | 50 |
| Assistant Surgeons ... ... ... ... | 30 |
| Hospital Assistants ... ... ... ... | 15 |

## Pensions for the Widows and Children of deceased Police Officers.

Application made by the Government of Bombay.

In March 1897, the Government of Bombay brought to the notice of the Government of India that it had been reported to them that the police employed on plague duty might possibly desert unless some provision was made by the Government for the widows and children of such as might die of plague contracted in the execution of their duty, and they added that in dealing with the existing problem one of the difficulties which confronted them was the fear of the disease entertained by the Police—a fear which sprang not merely from a natural anxiety as to their personal safety, but also from the knowledge that if they fell victims to the pestilence, their widows and families would be left unprovided for and in many cases destitute. These apprehensions, said the Government of Bombay, could neither be wondered at nor condemned, and the Government had to deal with the fact that any serious defection among the members of the force would bring to a standstill the measures most necessary for the suppression of the plague. It was added that of the actual mortality among the police, statistics were not then available, except for the City of Bombay, where 57 members of the force had died of the plague, the infection having been contracted, in most cases, in the performance of special duties in connection with this disease. Their widows and children, who were left destitute, naturally turned to the State for aid, and the Government of Bombay could give them no other answer than that their claims are inadmissible. The effect on the *morale* of the police still employed on plague duty could not, it was said, but be disastrous, and, in the opinion of the Governor in Council, it was not to be expected that the men should, under these conditions, continue faithfully and cheerfully to perform the duties which they were required to discharge, in the absence of some special concession suitable to the nature of the special risks they had to incur. For these reasons the Governor in Council expressed his earnest hope that the Government of India would

be pleased to empower the Government of Bombay to grant suitable pensions to the widows and children of police officers who had met or might meet their death through plague contracted in the discharge of their duties in localities where the presence of the plague threw special work on the police.

**Instructions issued by the Government of India.**

The Government of India accepted the view of the Government of Bombay and stated that they were willing that police officers who had met or should meet death through plague, contracted in the discharge of duties connected with the plague, should be considered as killed in the execution of duty attended with extraordinary bodily risk within the meaning of Articles 781 and 782 of the Civil Service Regulations, and authorised the Government of Bombay to act on this interpretation. This concession enabled pensions to be granted to the widows and children of the deceased police officers.

# CHAPTER XIV.

## REGULATIONS AGAINST ARRIVALS FROM INDIA ENFORCED IN OTHER COUNTRIES.

### General Remarks.

Summary of regulations.

In Appendix XI a summary is given of the regulations prescribed from time to time in other countries with a view to prevent the infection of plague being introduced by vessels, persons and merchandise arriving from India. When the outbreak first became virulent in India, the alarm experienced in Europe and other parts of the world was very great, and in some cases the restrictions imposed on intercourse with this country were both antiquated and exceedingly onerous. The terrible history of former plague epidemics has left a deep impression throughout Europe and Western Asia, and the panic experienced on the discovery that one of the important commercial centres of the world was infected with the disease cannot be a matter for surprise. In the end wiser and more moderate counsels prevailed. Eminent and trusted scientific authorities demonstrated that, with the improved sanitary conditions and the more advanced scientific methods that now exist, the position was completely changed, and that the extreme alarm that had been experienced was to a large extent without foundation. The Sanitary Conference which assembled at Venice then drew up a set of regulations, accepted by the delegates of most of the principal States of Europe, which prescribed precautionary measures for the countries in which the disease existed and for countries in connection with them, based on approved scientific principles and calculated to prevent the spread of disease without disastrous interruption of trade and communication.

Alarm in Europe.

Venice Sanitary Conference.

**Regulations modified in accordance with Venice Convention.**

The main features of these regulations have already been described as well as the action taken by the Government of India to secure compliance with them in this country. The principal maritime countries in close communication with India for their part also modified their precautionary measures in accordance with the Venice Convention without waiting for that Convention to be formally ratified. The modified regulations issued by the Governments of France, Italy, and Belgium are reproduced at length in the Appendix to this chapter.

**Main divisions of the subjects.**

In examining the regulations enforced in other countries there are two main points to be considerd: one, the treatment accorded to vessels and their passengers; the other, the restrictions imposed on the importation and transit of merchandise. These two portions of the subject will now be separately discussed.

## Regulations respecting Vessels and Passengers.

### SUEZ CANAL.

**Passage of the Suez Canal.**

The first point to notice, of paramount importance to India, is the passage of the Suez Canal. From the outset no serious obstacle was placed to the passage of vessels from Bombay and the rest of India from the Red Sea to the Mediterranean.

**Plague regulations of 1894.**

About the 6th of October the Egyptian Sanitary Board put into force their plague regulations of June 1894, slightly modified with respect to the treatment of vessels on which no case of plague had occurred.

**Threefold classification of ships.**

These regulations follow the Venice Sanitary Convention of 1892 except that they require a more rigorous treatment of infected vessels. They are based on the threefold classification of ships into healthy, suspected, and infected. Healthy vessels from an infected port are defined by the regulations as those on which no case of plague has occurred either at the time of departure or subsequently; suspected vessels as those on which, though cases of plague have occurred, no fresh case has occurred within nine days; and infected vessels as those on which plague has been present within nine days of arrival.

**Healthy ships.**

Healthy vessels are granted free pratique by the regulations seven days after departing from the infected port and they were therefore permitted to pass through the Canal after satisfactory

**Suspected ships.**

interrogation and medical inspection. Suspected vessels carrying a

medical officer and disinfecting stove were allowed to pass through the Canal in quarantine. The rules required suspected vessels which did not carry a doctor or disinfecting stove to be detained at Moses's Wells for the period required for disinfection and for ascertaining the condition of the ship's health. Unlike the Venice Convention of 1892, the regulations dealing with infected vessels made no distinction between vessels which did and which did not carry a doctor and a disinfecting stove. The rules prescribed that all infected vessels should be detained at the sanitary station, where the sick were to be landed and detained in hospital, and the healthy landed and detained under observation for a period not exceeding seven days from the occurrence of the last case of plague. The baggage of the persons on board the vessel and susceptible articles in the cargo were also to be disinfected.

Infected ships.

During the whole period of the epidemic only one infected vessel arrived at Suez, and in the case of that vessel it was found impossible to carry out the prescribed regulations. The vessel in question was the hired transport *Dilwara* bound for Southampton and carrying 1,325 persons, mostly soldiers returning from India and their families. On the 18th March the daughter of a sergeant died of plague on board the vessel, which arrived at Suez on the morning of the 20th. In the quarantine station at Moses's Wells there was only accommodation for twelve persons, and it was not therefore possible to land and detain over one thousand people. In the end the persons who had been in immediate contact with the patient—her father and mother—were landed for a ten days' detention and disinfection of their baggage, and the vessel was allowed to pass through the Canal in strict quarantine. No further case occurred on board.

Passage of the Canal by the infected ship *Dilwara.*

Early in February regulations were issued prohibiting the inspection of vessels from infected ports during the night, and requiring the passage of vessels in quarantine to be so arranged that they arrive at Port Said during the daytime.

Complete directions for the passage of the Canal are laid down in the regulations of the Venice Sanitary Convention of March 1897. They are based on the threefold classification of ships into healthy, suspected, and infected adopted in the Venice Convention of 1892, with the modifications rendered necessary owing to the period of incubation in the case of plague having been fixed at ten days.

Regulations of the Venice Convention.

Threefold classification of ships.

Healthy vessels are those which have left an infected port for ten days or more and have had no case of plague on board; suspected vessels are those on which, though cases of plague have occurred, no fresh case has occurred within twelve days; and infected vessels are

those on which plague has been present within twelve days of arrival.

The period of twelve days is arrived at, as in the case of the seven days' period in the Convention of 1892, by adding two days to the period of incubation.

**Healthy ships pass the Canal in quarantine.**

A healthy vessel thus becomes entitled to free pratique at a port at which it arrives ten days or more after leaving an infected port, but the adoption of this period has the serious result that fast vessels sailing from Bombay arrive at the Suez Canal before pratique can be granted. This difficulty has been satisfactorily overcome by permitting healthy vessels to pass through the Canal in quarantine and to complete in the Mediterranean the ten days necessary to receiving free pratique at a port of arrival. Vessels passing through the Canal in quarantine may, subject to the use of electric light, coal in quarantine at Port Said by night as well as by day, and passengers may embark in quarantine at that port.

**Infected and suspected ships.**

The rules for infected and suspected ships follow those of the Venice Convention of 1892. Vessels carrying a doctor and a disinfecting stove are allowed to pass through the Canal in quarantine after, in the case of infected vessels, landing those suffering from plague and persons who have been in actual contact with the sick or with infected articles, and after disinfection of the infected part of the vessel. Vessels without a doctor and disinfecting stove are detained at Moses's Well. Such vessels if suspected are detained for the period required for disinfection and for ascertaining the condition of the ship's health, while, if infected, the passengers are detained on shore under observation for a maximum period of ten days. The segregation accommodation and the medical and sanitary staff at Moses's Wells are being increased for the purpose of carrying out these regulations.

The Egyptian Sanitary Board issued revised plague regulations on the lines of the Convention regulations described above.

## UNITED KINGDOM.

**Local Government Board Rules of November 1896.**

In the United Kingdom arrivals from infected Indian ports were dealt with under the "General Regulations as to Cholera, Yellow Fever and Plague" issued by the Local Government Board on the 9th November 1896. These regulations, which are based on advanced scientific principles, offer practically no hindrance to communication with India.

**Healthy ships. Infected ships.**

If the medical inspection of the vessel is satisfactory the rules permit immediate free communication. If the vessel is found

to be infected, it is required to anchor at an appointed mooring and a detailed examination is made of every-one on board. Persons certified to be suffering from plague, etc., are, if their condition admits of it, landed and detained in hospital. If not, they are detained on board. Persons suffering from illness which it is suspected may be plague are detained for forty-eight hours, either on board or on shore, with a view to determine the nature of their illness. Other persons are permitted to land and proceed to their destination after giving their names and intended addresses. These particulars are communicated to the local authorities in order that the health of the travellers may be watched for a few days. The clothing, bedding and other articles of personal use belonging to sufferers from plague, etc., are disinfected or destroyed. The ship is disinfected, and any articles that may probably be infected (other than those mentioned above) are disinfected or destroyed. The medical officer may direct the bilge-water and water ballast to be pumped out before the vessel enters the dock or basin, and when a fresh supply of drinking and cooking water can be provided, he may direct all casks and tanks containing such water to be emptied and cleaned. The medical officer may, at his discretion, direct that the precautions regarding passengers, and bilge and drinking water, shall be carried out in the case of healthy vessels arriving from an infected port.

Examination of persons on board. Removal of sick.

Treatment of other persons.

Disinfection.

Change of water.

During the period of the epidemic in the Bombay Presidency, special inspections were made by officers of the Local Government Board of all ports in England and Wales which are used by vessels employed in trade with India.

## FRANCE.

The regulations imposed in France were for a time most severe and prevented passenger steamers from India from calling at French ports. In Marseilles the population were much alarmed and excited, and some vessels which arrived from Bombay were prevented from landing their passengers. On the 4th January the French Government issued a Decree prescribing a set of general regulations to prevent the infection of exotic epidemic diseases being brought into French ports. These regulations were based on the Sanitary Conventions of Venice, 1892, and Dresden, 1893. The measures actually taken went far beyond the regulations.

Alarm and severe restrictions.

General rules of January.

The most stringent provisions of the regulations were applied both to southern ports in communication with the East and to northern ports in communication with Plymouth by orders issued in the middle of January,

Later orders.

Early in February the port of Dunkirk imposed four days' quarantine on healthy arrivals from infected ports, and nine days' quarantine on infected vessels. Later in the month the landing of passengers from infected ports was prohibited at all ports except Pauillac, Saint-Nazarre, Havre and Dunkirk, and disembarkation was permitted only after eight days' observation at Pauillac and Saint-Nazarre, and four days' observation at Havre and Dunkirk, and after disinfection of baggage. In the middle of March orders issued permitting passengers to land at Marseilles after medical inspection and the disinfection of their baggage, but about the 12th April further orders required all vessels coming from infected ports in India to undergo thirty-six hours' quarantine. In the end passengers were allowed to land at Marseilles from healthy ships with the restriction that their soiled linen, etc., must be disinfected before being brought on shore.

Passengers eventually allowed to and at Marseilles.

## ITALY.

Onerous restrictions.

In Italy, also, during the height of the epidemic and before the framing of the Venice Convention, vessels arriving from Bombay, Karachi and other infected ports were only permitted to land passengers under regulations with respect to disinfection, etc., so onerous that ships of the Peninsular and Oriental Company merely landed the mails at Brindisi and then carried their passengers to England. The Italian Government issued regulations based on the Venice Sanitary Convention on May 8th, 1897. Under these regulations healthy vessels are allowed free pratique after a satisfactory medical inspection subject to the following precautionary measures: disinfection of the wearing apparel and personal belongings of the persons on board either before embarkation, during the voyage, or on arrival; pumping out the bilge-water after disinfection; and the substitution of fresh drinking-water for the water stored on board. Rules for the treatment of suspected and infected vessels were also laid down in accordance with the Venice Convention, but it never became necessary to bring them into force. It is the treatment accorded to healthy vessels which is the crucial point. To facilitate the execution of the prescribed measures, the Italian Government made arrangements to appoint medical officers at Port Said on application to any vessel bound for an Italian port. This doctor is entrusted with the general sanitary surveillance of the ship during her passage from Port Said to the Italian port. Within forty-four hours of arrival he is required to ascertain that the disinfection of soiled articles of wearing or domestic apparel has been carried out, and to make a medical examination of

Later regulations based on the Convention. Healthy vessels.

Arrangements to facilitate the precautionary measures.

all persons on board. On arrival he lodges with the harbour authorities a statement certifying to the sanitary condition of the vessel, and if everything is satisfactory free pratique is at once granted.

## BELGIUM.

The regulations imposed in Belgium were from the outset more moderate. On the 18th January the royal decree of 1895 relating to cholera was applied to arrivals from plague-infected Indian ports. The decree of 1895 was based on the Dresden Convention of 1893 and classed vessels as healthy, suspected and infected in accordance with the regulations prescribed by that Convention. More detailed orders issued on the 6th February for the treatment of vessels at Antwerp. The detention of vessels for one tide at the sanitary station of Doël was permitted for the purpose of medical inspection, disinfection of such portions of the ship as was considered necessary, and change of water, etc. On the 3rd April a decree was issued requiring healthy and infected ships to be treated in accordance with the regulations of the Venice Sanitary Convention of 1897. The Belgium Government enquired what portion of India should be considered as infected for the purpose of the rules, and, in accordance with information supplied by the Government of India, they declared the whole of the Bombay Presidency and Sind, except the extreme east of the latter province, infected with plague.

Royal decree of 1895 enforced.

Treatment of healthy vessels at Doël.

Regulations based on the Venice Convention.

## BRITISH MEDITERRANEAN DEPENDENCIES.

The British dependencies in the Mediterranean were quite as stringent in their regulations as foreign European countries.

In Malta a series of regulations were issued of gradually increasing severity. At the end of December orders were issued refusing pratique and the disembarkation of passengers in the case of vessels on which there was a case of fever. Early in January two days' quarantine was imposed on arrivals from Indian ports; in the middle of the month the period was raised to twenty-one days, and shortly afterwards the disembarkation of passengers from Indian ports was absolutely prohibited. Vessels were only permitted to take in provisions in quarantine. Afterwards these prohibitive regulations were to some extent relaxed.

Malta. Severe restrictive measures.

Early in February regulations issued permitting healthy vessels from India to land passengers at Comino Island; the passengers were then subjected to twenty-one days' quarantine and their clothing and linen were disinfected. Towards the middle of May the restrictive orders were confined to arrivals from ports on the West Coast of India. On the

Partial relaxation.

In the Venice Convention, 1897.

reserved this portion of the regulations from assent. The Venice Convention of 1897 also contains regulations for the control of quarantine in the Persian Gulf, which differ considerably from those prescribed in the Paris Convention and remove the main objections. Under the Venice Convention regulations healthy vessels reaching Ormuz before the expiration of ten days since they last touched at a port infected with plague must either complete that period at Ormuz or may, after medical inspection, continue their voyage up the Gulf or the Shatt-ul-Arab, provided they do so in quarantine for such term as is required to complete the ten days. The same provision will apply to suspected vessels, that is, vessels on which there has been a case of plague, but no fresh case for twelve days, subject to submission to certain processes of disinfection, etc., at Ormuz; and infected vessels will, after landing their sick, together with those persons who have been in actual contact with them, and after disinfection of that part of the vessel deemed to be infected, likewise have permission to proceed on their voyage in quarantine. The final arrangements as to the sanitary station at Ormuz are to be a matter of agreement between the Turkish and Persian Governments, and until these arrangements are completed, a temporary sanitary station is to be established on one of the islands in the Straits of Ormuz.

## CEYLON.

Owing to its proximity to the infected area and its peculiar position as a general port of call, the Government of Ceylon considered it necessary to adopt very stringent precautionary measures with respect to arrivals from India.

Tuticorin, in the extreme south of the Madras Presidency, is the port in closest and most constant communication with Colombo, but there is also frequent communication between Colombo and the principal ports on the West and East coast of India. Early in the epidemic fifteen days' quarantine was imposed on all arrivals from Western Indian ports. On the 2nd of March a set of general quarantine regulations were issued by the Colonial Government under which the fifteen days' quarantine was still maintained. As an additional precaution, passengers recently arriving from an infected district on a steamer from a healthy port were not permitted to land, though the vessel herself was not quarantined. An account has been given in Chapter XI of the measures adopted by the Madras and Ceylon Governments in co-operation to prevent infected persons crossing from Tuticorin to Colombo. The Colonial

Fifteen days' quarantine.

Government issued on the 23rd of July a set of regulations based on the Venice Convention of 1897 and enforced the most stringent regulations authorised by the Convention. The period of quarantine of healthy vessels was limited to ten days from the date of departure from an infected port. The Colonial Government reserved to itself the right to impose precautions beyond those permitted by the Convention if this course were deemed advisable. Regulations based on the Venice Convention.

## OTHER ASIATIC PORTS.

Goa, the principal Portuguese possession on the West Coast of India, lies immediately south of the infected area. In the middle of October the Goanese authorities imposed five days' quarantine against arrivals from Bombay and southern ports. A number of cases were detected and detained in the lazaret, but, so far as is known, the disease never became epidemic in Goa. The Netherlands India Government first imposed ten days' quarantine against arrivals from Bombay and Karachi and subsequently reduced the period to nine days from the date of departure. In Siam vessels from Bombay were inspected at Pakanam before being permitted to proceed to Bangkok. Goa. Netherlands India. Siam.

## EGYPT.

The regulations enforced in African countries have next to be considered. The arrangements for the passage of the Suez Canal, first under the Egyptian plague regulations of 1894 and then under the Venice Convention of 1897, has already been described. Vessels bound for Egyptian ports were dealt with under the same regulations. Under the 1894 regulations, as modified by the Egyptian Sanitary Board, healthy vessels were granted free pratique after satisfactory medical inspection and the disinfection of dirty linen, etc., etc. The rules for suspected vessels with a healthy passage of less than fourteen days required a forty-eight hours' detention of the ship for the purpose of disinfecting the vessel, the baggage and the susceptible cargo. Passengers were also to be detained forty-eight hours on shore and their baggage disinfected. The rules for infected vessels seeking free pratique in Egypt required seven days' detention from the date of the last case and the usual disinfection, etc. African countries. Plague regulations of 1894. Healthy ships. Suspected ships. Infected ships.

The regulations issued by the Egyptian Quarantine Board in conformity with the Venice Sanitary Convention grant free pratique to healthy vessels after ten days from the date of departure, and such medical inspection and disinfection of clothing, etc., etc., as may be Regulations based on the Venice Convention. Healthy ships.

Suspected ships. considered necessary. In the case of suspected vessels which have had a healthy passage of less than fourteen days, the rules require both the ship and the passengers to be detained for a period sufficient to complete ten days, and the usual measures of disinfection, etc., are

Infected ships. prescribed. Infected vessels seeking free pratique in Egypt must be detained at Moses's Wells up to ten days from the date of the last case, and must undergo the usual procedure of disinfection, etc.

### OTHER AFRICAN PORTS.

Algiers, Morocco, Madagascar and Natal. The regulations for France applied also to Algiers. Under orders issued early in February, Morocco repulsed all ships from Indian ports. Similar prohibitive orders were issued for Madagascar. At Natal twelve days' quarantine was imposed against arrivals from Bombay.

### AMERICA AND AUSTRALIA.

American countries. Notwithstanding the great distance of American ports from India, arrivals from countries in the Western Hemisphere issued regulations

United States. against arrivals from India of varying severity. The United States applied the Treasury Quarantine Cholera Regulations, which require

Brazil. fifteen days' detention of exposed persons. Brazil declared all ports in India and Burma infected and required vessels to proceed to the

Peru. quarantine station at Ilha-Grande. Peru imposed ten days' quarantine against arrivals from infected ports.

Australian colonies. The Peninsular and Oriental Steam Navigation Companies' Agents at Bombay stated that the regulations imposed in the Australian colonies were so onerous that they were obliged to cease booking passages to them.

## Regulations regarding Merchandise.

In Chapter II it has been explained that although the infection of plague may be readily carried in objects that have been in contact or in close proximity to plague patients, there is no reason to apprehend that the infection is spread by ordinary articles of commerce.

In Chapter XI an account has been given of the regulations regarding merchandise contained in the Venice Convention and of the measures adopted in India to prevent the spread of the disease by articles likely to carry infection. It now remains to notice the treatment accorded in other countries to merchandise arriving from India during the epidemic.

In the first place it will be convenient to recapitulate the articles classed as susceptible by the Venice Convention. They are the following:— Venice Convention.

(1) Used body linen, clothes, bedding, and other personal effects.
(2) Rags, including rags compressed by hydraulic pressure and transported in bales as merchandise.
(3) Used sacking, carpets, and old embroidery.
(4) Raw and untanned hides and skins.
(5) Animal refuse, claws, hoofs, horsehair, hair of animals generally, raw silk, and wool.
(6) Human hair.

It will be remembered that the articles included in this list may be refused entry at the option of the Government concerned, and that disinfection may be prescribed before admission in the case of susceptible articles and any other articles with regard to which the precaution may be considered necessary by the local sanitary authority.

The following list shows the principal articles of the Indian merchandise foreign export trade, and the average annual value of the trade in each (in lakhs of rupees) for the five years 1891-92 to 1895-96*:— Staples of the Indian export trade.

| | |
|---|---|
| 1. Grain and pulse | 20,19 |
| 2. Cotton, raw | 11,92 |
| 3. Jute, raw | 8,78 |
| 4. Seeds | 12,90 |
| 5. Opium | 8,87 |
| 6. Cotton, yarn and cloth | 7·37 |
| 7. Tea | 6,81 |
| 8. Hides and skins | 6,16 |
| 9. Indigo | 4,33 |
| 10. Jute, manufactures | 3,03 |
| 11. Coffee | 2,08 |
| 12. Lac | 1,15 |
| 13. Wool, raw | 1,19 |
| 14. Provisions | 83 |
| 15. Dyes (other than indigo) | 83 |
| 16. Wood and timber | 67 |
| 17. Oils, including paraffin wax | 66 |
| 18. Sugar | 61 |
| 19. Silk, raw | 60 |
| 20. Spices | 48 |
| 21. Saltpetre | 42 |

Only three of these articles fall within the susceptible list, namely, hides and skins (No. 8), raw wool (No. 13), and raw silk (No. 19). "Susceptible" articles of Indian trade.

The trade in hide and skins is much the most important of the three. It is mainly concentrated in Calcutta.

* Review of the Trade of India in 1895-96 by J. E. O'Conor, Government of India Statistical Bureau.

Hide and skins.

The following statement shows the amounts and value of the hides and skins exported to different countries in the year 1895-96, and the share of each presidency or province in the trade :—

| Countries to which exported. | Quantities. Cwt. | Value. Rs. | Share of each Presidency or Province. Presidency or Province. | Quantities. Cwt. | Value. Rs. |
|---|---|---|---|---|---|
| *Hides.* | | | | | |
| United Kingdom ... | 117,951 | 46,55,385 | Bengal ... | 511,735 | 2,12,44,943 |
| Austria-Hungary ... | 33,756 | 14,55,024 | | | |
| Belgium ... | 676 | 30,312 | Bombay ... | 2,104 | 47,998 |
| France ... | 65,072 | 29,70,722 | | | |
| Germany ... | 227,241 | 97,22,087 | Sind ... | 77,711 | 30,98,546 |
| Greece ... | 84 | 1,500 | | | |
| Holland ... | 1,516 | 64,920 | Madras ... | 196 | 5,634 |
| Italy ... | 69,005 | 29,67,443 | | | |
| Russia in Europe ... | 137 | 4,050 | Burma ... | 58,089 | 17,06,322 |
| Spain (excluding Gibraltar) | 1,915 | 1,11,420 | | | |
| Turkey in Europe ... | 4,134 | 1,42,098 | | | |
| Eastern Coast of Africa, Zanzibar. | 7 | 324 | | | |
| Egypt ... | 13,519 | 3,91,905 | | | |
| United States ... | 87,399 | 28,30,305 | | | |
| Aden ... | 54 | 1,310 | | | |
| Arabia ... | 139 | 3,721 | | | |
| Ceylon ... | 142 | 3,384 | | | |
| China—Hong-kong .. | 7 | 350 | | | |
| Japan ... | 8 | 176 | | | |
| Persia ... | 315 | 10,392 | | | |
| Straits Settlements ... | 26,180 | 7,02,607 | | | |
| Turkey in Asia ... | 438 | 15,916 | | | |
| Australia ... | 140 | 12,692 | | | |
| TOTAL ... | 649,835 | 2,61,03,443 | TOTAL ... | 649,835 | 2,61,03,443 |
| *Skins.* | | | | | |
| United Kingdom ... | 4,326 | 3,91,073 | Bengal ... | 91,998 | 99,52,960 |
| Austria-Hungary ... | 61 | 3,950 | | | |
| Belgium ... | 143 | 12,665 | Bombay ... | 757 | 37,506 |
| France ... | 3,029 | 1,89,447 | | | |
| Germany ... | 1,996 | 1,10,167 | Sind ... | 2,584 | 1,28,392 |
| Holland ... | 344 | 21,330 | | | |
| Italy ... | 1,207 | 47,537 | Madras ... | 1,071 | 60,481 |
| United States ... | 84,887 | 93,56,753 | | | |
| Arabia .. | 1 | 60 | Burma ... | ... | 150 |
| Ceylon ... | 71 | 3,075 | | | |
| China—Hong-kong ... | 206 | 24,822 | | | |
| Japan ... | 29 | 2,957 | | | |
| Persia ... | 38 | 1,050 | | | |
| Russia in Asia ... | 28 | 1,550 | | | |
| Straits Settlements ... | 43 | 2,788 | | | |
| Australia ... | 1 | 45 | | | |

Countries concerned in the trade.

The export of hides is principally to Germany which took more than a third of the total exports in 1895-96. In the same year the United Kingdom took rather more than a sixth, Italy rather less than a ninth, France a little over a tenth, and the United States between a seventh and an eighth of the total exports. The shipments of skins are mainly to the United States which received more than ninth-tenths of the total exports in 1895-96.

Restrictive measures.

Germany, France and Italy.

The restrictive measures imposed on the export trade in hides from India were the subject of considerable discussion. The trade was at first regarded as specially dangerous by the foreign countries concerned, and Germany, France and Italy prohibited the importation of hides from India. The wording of the French Regulation on the subject referred only to arrivals from infected ports, but it is believed that for a time the prohibition against all Indian hides was absolute.

Protest of the Calcutta merchants.

At the instance of the Calcutta merchants interested in the trade, the Bengal Chamber of Commerce addressed the Government of India on the subject of the restrictions. The merchants pointed out that the prohibition occasioned grave inconvenience and loss, and that the stoppage of the trade from Calcutta appeared to be altogether unnecessary. In the first place the port of Calcutta was not infected and hides from infected districts did not come there. In the next place, the hides are all shipped in a perfectly dry condition. A small portion of them are cured and known as "dry salted," and the bulk are carefully cleansed before being dried and immersed in a bath of solution of arsenic whereby any germs are effectually destroyed. The Calcutta Medical Board expressed a confident opinion that the arsenical process cannot fail to destroy all germs and spores of germs.

Relaxation of the restrictions.

France

Italy.

The Government of India communicated the circumstances to the Secretary of State in a telegram, dated the 5th February, and stated that it was presumed that the matter would be discussed by the Venice Conference. Subsequently all three Governments materially relaxed the stringency of their regulation. In March France permitted the importation of arsenicated and dry salted hides for India. The regulations issued by the French Government under the Venice Convention permit the importation of raw hides and untanned skins, but require them to be disinfected if they come directly or indirectly from an infected locality. In issuing regulations in conformity with the Venice Convention the Italian Government exercised the option of prohibiting the importation of raw hides and skins from infected ports, but permitted the importation from other ports, provided the goods are accompanied

Germany.

by a medical certificate and certificate of origin. In March the German Government admitted hides from non-infected ports, provided they were compressed in air-tight bales and prepared for transport in or near the port of departure. Later in the same month the prohibition against dry salted and arsenicated hides was confined to consignment from infected ports, and in May the importation of untanned air-dried hides, known in the trade as "kips," was admitted unconditionally. The revised list of prohibited articles published by the German Government on the 6th September contains no prohibition against the import of any sort of hides or skins.

Raw wool.

Raw wool is a staple article of Bombay and Karachi trade representing a yearly value of more than a crore of rupees. The following statement shows for the year 1895-96 the value of the trade with the different countries and the share of each presidency or province in it :—

| Countries to which exported. | Quantity. | Value. | Share of each Presidency or Province. | | |
|---|---|---|---|---|---|
| | | | Presidency or Province. | Quantity. | Value. |
| | lbs. | Rs | | lbs. | Rs. |
| United Kingdom... | 30,132,68[illegible] | 1,31,03,350 | Bombay ... | 16,968,012 | 79,93,608 |
| Austria-Hungary ... | 11,83[illegible] | 5,01[illegible] | Sind ... | 10,240,069 | 44,28,063 |
| Belgium ... | 33,600 | 16,000 | Bengal ... | 3,231,033 | 10,53,570 |
| France ... | 383,208 | 1,84,600 | Madras ... | 602,664 | 75,841 |
| Germany ... | 6,63[illegible] | 1,812 | | | |
| Italy ... | 133 | 55 | | | |
| Egypt ... | 21,429 | 2,167 | | | |
| United States ... | 79,125 | 24,90[illegible] | | | |
| Japan ... | 365,511 | 2,12,311 | | | |
| Straits Settlements | 7,62[illegible] | 869 | | | |
| TOTAL ... | 31,041,778 | 1,35,51,082 | TOTAL ... | 31,041,778 | 1,35,51,082 |

The trade with the United Kingdom is by far the most important. France and Japan are the only other countries which receive any considerable amount.

United Kingdom.

The possibility of the infection being carried from India to England in wool formed the subject of considerable discussion during the Bombay epidemic. Anxiety was expressed by British manufacturers lest plague contagion should be brought to England in bales of wool. The wool exported from Bombay is received from Rajputana, Joria, Kathiawar, Ahmedabad, the Persian Gulf, and Kashmir. It is mostly picked, cleaned and pressed in the native town of Bombay, only a small part being cleaned up-country. The pressed bales are sometimes shipped at once and sometimes kept in the godowns for weeks. The wool exported from Karachi is washed in cold water and picked by hand by coolies in Karachi, and is then taken to presses and shipped. After discussion with the Government of Bombay and the persons interested in the wool trade it was not found possible to devise means to specially preserve the wool from the possibility of infection or to disinfect it, which would not amount to practical prohibition of the trade. The authorities in the United Kingdom were advised that there was not evidence to show that danger existed through the arrival of bales of wool from ports in which plague existed, and it was not considered necessary to prohibit their importation. It is a most noteworthy fact that from the 1st October 1896 to the 28th February 1897 ten million pounds of wool were exported from Bombay and Karachi to the United Kingdom, and that, so far as is known, no cases of plague occurred among the classes dealing with or using this Indian wool. From the end of February the export of wool from Bombay to England continued and without, so far as is known, causing a single case of plague.

France.

In France orders issued in March especially prohibiting the importation of wool from infected ports. The regulations framed by the French Government under the Venice Convention permit the importation of wool, but require both the raw and manufactured article to be disinfected if it arrives directly from an infected port.

Silk.

The silk trade is centred in Bengal, and the value exported from Bombay and Sind is trifling. In 1895-96 France took more than one-half of the total value of the export, the United Kingdom received rather less than one-third, and Italy, which comes next, took only about one-fourteenth. Neither the United Kingdom, France nor Italy issued any restrictive orders with respect to the import of raw silk.

No restrictive measures.

General regulations issued by Foreign Governments.

Having noticed in detail the treatment accorded to the three staple articles of the Indian export trade which appear in the "susceptible list" of the Venice Convention, it remains to notice the general regulation with respect to merchandise from India issued from time to time in different countries.

Statistics of the export trade to Europe.

The following statement shows the value (in lakhs of rupees) of the exports of Indian merchandise to the different European countries during the year 1895-96 :—

| | |
|---|---|
| United Kingdom ... ... | 35,00 |
| France ... ... ... | 8,66 |
| Germany ... ... | 8,05 |
| Belgium ... ... ... | 3,94 |
| Austria-Hungary ... ... | 3,34 |
| Italy ... ... ... | 3,12 |
| Other countries ... ... | 1,55 |
| TOTAL | 63,66 |

Restrictions in European countries.

In the United Kingdom no restrictions were enforced against goods arriving from India. The following is the purport of the orders issued in France, Italy, Belgium, Germany, and Austria-Hungary with respect to goods other than the three articles already discussed.

*France.*

* *January 10th.*—Importation of the following articles from infected ports prohibited : Cotton and other rags, body linen, personal effects and used clothing and bedding (except when carried as personal baggage), animal matter and refuse, claws and hoofs.

*January 28th.*—The landing of all goods from infected ports prohibited at Mediterranean ports.

*March 18th.*—Importation of rags, animal refuse and wool prohibited. Oilseeds, carpets and coprah admitted after disinfection. Steamers with interdicted cargo for English ports permitted to discharge other cargo in quarantine.

*April 16th.*—Regulations based on the Venice Sanitary Convention :—

(i) Importation of the following articles coming directly or indirectly from infected localities prohibited : Rags, animal refuse, claws and hoofs.

(ii) The transit trade in the same articles prohibited if involving unloading or handling.

(iii) Raw and manufactured wool coming directly from an infected locality admitted after disinfection. Used and unused body linen, personal effects, clothing and bedding, raw hides and untanned skins, coming directly or indirectly from an infected locality admitted after disinfection.

* Dates only approximate.

(iv) Vessels carrying articles named in (iii) only permitted to enter the ports of Marseilles, Pauillac, Saint-Nazarre, Havre and Dunkirk.

(v) Bales containing articles named in (i) to (iii) coming from infected ports in the West Coast of India only admitted if accompanied by a certificate of origin.

*Italy.*

*December.*—Importation of horsehair, animals and portions of animals, and rags prohibited.

*May 8th.*—Importation prohibited of all articles included in the "susceptible" list of the Venice Convention, coming directly or indirectly from an infected locality, except raw silk, old sacking, carpets and old embroidery. Interdicted goods coming from a healthy port to be accompanied by a medical certificate and certificate of origin.

*Belgium.*

*January 8th.*—Under the royal decree of July 1895 the importation from infected localities of rags and linen, clothing, personal effects and bedding prohibited. Exception made in the case of compressed rags conveyed in bales as merchandise and certain mercantile waste products not liable to contamination.

*February 6th and 17th.*—Importation of the following articles forbidden even in transit: (1) hides (except salted green hides treated with arsenic), hoofs, animal refuse, etc.; (2) used or unused wearing apparel and bedding; (3) carpets, woollen goods, silk stuffs; (4) small articles of retail trade likely to be contaminated; (5) bottles of liquor and perfumes, imported retail; (6) dress goods, drill, etc., when not compressed in bales; (7) all animal and vegetable textile and similar products if not packed in pressed bales and bound with hoops. The prohibition was subject to the proviso that all the articles except those numbered (1) and (5) might be admitted after disinfection at Doel. Raw wool in pressed bales and dress goods and drill stuffs packed in pressed bales were admitted in transit, but not for sale in Belgium.

*April 5th.*—Importation from an infected locality of all the articles included in the "susceptible" list prohibited. Provided that exemption may be granted by ministerial decree in the case of raw wool, raw hides and untanned skins, and certain classes of rags and carpets, subject to any precautions that may be prescribed with respect to packing, disinfection, etc. The transit of the interdicted articles is permitted if they are packed in such a manner that they cannot be handled on the way. A certificate of origin may be required in the

case of articles on the interdicted list coming from an infected locality.

*Germany.*

*February 8th.*—Importation of the following articles from India prohibited: used bed and body linen, rags, old clothes, carpets, human hair, bristles, hair of animals, wool, claws and hoofs.

*September 6th.*—Importation of the following articles only prohibited: used body and bed linen, old clothes, rags.

*Austria-Hungary.*

*February 12th.*—Importation of the following articles from India prohibited: rags, trotters, unwashed and old clothes, used bed linen, old carpets, covers, bed furniture.

*March 11th.*—Importation of the following articles prohibited: raw skins and hides, bones, horns, hoofs, trotters, animal offal, hair and brushes.

*Other European Countries.*

It would be wearisome to state in detail the restrictions on the importation and transit of merchandise imposed in the remaining European countries. The regulations are summarised in the appendix to this chapter and in general prohibit (with or without qualifications) the import of articles that it is deemed may have come into contact with plague patients, or which are derived from animals.

**Malta.** **Spain.** **Portugal.** The following special points may however be noticed: Malta prohibited the import of jute goods and cotton seeds; Spain of wool, silk, linen, hemp and jute; Portugal of patterns and postal parcels, vegetables and manufactured cotton, hemp, wool, linen and silk goods.

**Bulgaria and Roumania.** **Jute sacks.** In Bulgaria the importation of all merchandise from India was at one time prohibited. Subsequently rice was admitted from Rangoon and jute sacks from Calcutta, in the latter case after disinfection. Roumania also prescribed the disinfection of jute sacks coming from healthy ports, and prohibited the introduction of old printed papers.

**Russia.** The Russian regulations required the exterior packing of tea chests to be disinfected. All other goods were permitted to enter without disinfection unless it was believed that they might have come into contact with plague patients, when the exterior packing or a superficial layer of goods might be disinfected. On the 10th March information was received by the Government of India that

**Indian tea at Batoum.** the importation of Indian tea to Batoum had been prohibited. The Indian Tea Association urged that the prohibition should be withdrawn, on the ground that it would have a very serious effect

on the tea trade, and that it was quite unnecessary. Indian tea is not grown or manufactured in or near the plague-infected area, and the tea shipped from Bombay is carried there in chests and is not at all a dangerous article. Enquiry was made from the Russian Government and it was ascertained that no prohibition against the importation of Indian tea was in existence, and that the prescribed process of disinfection, which was only applied to the outer coverings of the chests, could not possibly cause any injury to the tea.

## *Asia.*

Export trade to Asiatic countries.

The following is a statement of the value of the exports of Indian merchandise (in lakhs of rupees) to different Asiatic countries during the year 1895-96 :—

| | |
|---|---|
| Hong-kong ... ... ... ... | 8,10 |
| Straits Settlements ... ... ... ... | 5,85 |
| Treaty ports of China ... ... ... | 5,68 |
| Ceylon ... ... ... ... ... | 3,50 |
| Japan ... ... ... ... ... | 2,79 |
| Arabia ... ... ... ... ... | 85 |
| Aden ... ... ... ... ... | 76 |
| Persia ... ... ... ... ... | 61 |
| Turkey ... ... ... ... ... | 51 |
| Other countries ... ... ... ... | 64 |
| TOTAL ... | |

Ceylon.

From the beginning of the epidemic the Government of Ceylon prohibited the introduction of articles likely to be infected, and on the 19th February followed the Government of India in prohibiting the introduction from infected localities of rags, used apparel, bedding, waste paper, and used gunny bags. In adopting the regulations of the Venice Convention the Ceylon Government prohibited the entry and transhipment of all "susceptible" goods coming directly or indirectly from the West Coast of India.

Persia. Muscat.

Persia prohibited the importation of quilts, mattresses, blankets, skins, rags, cotton waste, and second-hand clothing. In Muscat the landing of rags and cotton waste, and other articles considered dangerous was prohibited.

Netherlands India.

The entry into the Netherlands India of the following articles coming from Bombay or Karachi was prohibited: butter, victuals, rags, raw wool, hair, hides, and furriery.

China.

The Government of India were not informed that any restrictive regulations were imposed at Hong-kong or the treaty ports of China.

## *Africa.*

**Export trade to Africa.**

The following is a statement of the export trade in Indian products to Africa during the year 1895-96 (value expressed in lakhs of rupees) :—

| | |
|---|---|
| Egypt ... ... ... ... ... | 5,17 |
| Mauritius ... ... ... ... | 1,09 |
| East Coast ... ... ... ... | 73 |
| Cape Colony ... ... ... ... | 35 |
| Natal ... ... ... ... | 24 |
| Abyssinia ... ... ... ... | 21 |
| Réunion ... ... ... ... | 19 |
| Other countries ... ... ... ... | 5 |
| TOTAL ... | 8,03 |

**Egypt.**

In Egypt the importation of the following articles was forbidden: rags, carpets, embroideries, body linen, personal effects, used garments and bedding (when not carried as baggage), animal products (including horsehair and raw wool), claws, hoofs, sacking, plants, roots, and fresh and dried fruits.

**Réunion.**

Réunion refused to allow the importation of rice from any Indian port.

# CHAPTER XV.

## THE PILGRIMAGE TO MECCA.

### The suspension of the pilgrimage from India.

The pilgrimage to the Hedjaz.

The annual pilgrimage of the Muhammadans to the Hedjaz is timed so that the pilgrims may be present at Mecca at the great ceremony of the *Haj*, which begins on the ninth day of the month of *Zil-Haj*. On the tenth day is the general Muhammadan festival of the *Bakra-Id*. The month of *Zil-Haj* being a lunar month, the date of the festival gradually shifts through the calendar months making the circuit of the solar year in thirty-six years. In 1897 the *Haj* began on the 11th of May. Some of the pilgrims from India leave many months before the date of the festival, but the bulk of the pilgrim ships sail for the Hedjaz about two months before the beginning of the *Haj*. Bombay is the usual port of departure, but pilgrims sometimes sail from Calcutta and more rarely from Karachi.

Alarm experienced in Europe lest the plague should be spread by pilgrims.

In the beginning of January, when the departure of pilgrims had already commenced, considerable alarm was experienced in European countries lest the infection of plague should be carried from India to the Hedjaz and thence into Europe. Egypt discouraged intending pilgrims from going to Mecca, France interdicted her Muhammadan subjects from making the pilgrimage, and Russia and Austria expressed grave uneasiness. Russia subsequently forbade the pilgrimage.

It was apprehended that unless steps were taken to allay the fears of the European Government, stringent regulations might be issued against all arrivals from India. In these circumstances the Government of India, although they were reluctant to close the infected ports to pilgrim ships, as this course could not fail to occasion inconvenience and concern to the Muhammadans of India, considered that the condition of affairs in Bombay and Karachi made it imperative to direct that these places should not for the time being be used as a rendezvous for pilgrims, and this view was shared by the Government of Bombay. Instructions were therefore sent to the Government of Bombay in accordance with which they issued a notification declaring that the ports of Bombay and Karachi should not, from the 1st February and until further orders, be ports from which pilgrim ships might depart or proceed as provided for in section 7 (1) of the Pilgrim Ships Act, XIV of 1895. Wide publicity to this decision was given through Local Governments and Administrations and the Political Officers of the Government of India at the different Native States, as well as through the public press and by means of notices published at all the principal railway stations. The Government

The infected ports of Bombay and Karachi closed to the pilgrim traffic.

of Bombay also issued a notification under the Epidemic Diseases Act prohibiting intending pilgrims bound for Bombay from coming beyond the railway stations of Ahmedabad, Bhusawal, Londa and Hotgi.

Endeavour to dissuade persons from making the pilgrimage.

Measures were at the same time taken to dissuade intending pilgrims from proceeding to the Hedjaz during the current season. It was ascertained from the Government of Bombay that there was no uninfected port on the Bombay coast from which pilgrim ships could depart, but Calcutta remained open to the pilgrim traffic and, at the request of the Government of India, the Government of Madras declared Madras to be a port for the departure and arrival of pilgrim ships. It was made widely known that pilgrim vessels might still proceed from these ports; the Government of Bombay were requested to give information on the subject to the persons interested in the Red Sea traffic, and the Government of Bengal was warned that it might be necessary for the authorities at Calcutta to be prepared for an influx of pilgrims. About a quarter of the pilgrims who depart from the port of Bombay are Asiatic Russian subjects, and it was suggested to Her Majesty's Government that the Russian Government should be requested to use its influence to prevent Russian pilgrims coming to India *en route* for Arabia.

Calcutta and Madras open to the pilgrim traffic.

Asiatic Russian pilgrims.

Strong protests against the embarkation of pilgrims from Madras.

Strong protests were received from the Government of Madras and various commercial and other public bodies in the Madras Presidency against pilgrims being permitted to depart from the port of Madras. They feared that these pilgrims might carry infection into Madras, and that the fact that they were allowed to sail from Madras might cause that port to be quarantined by European countries. The Government of India asked the Government of Bombay to dissuade all persons who had arrived in Bombay with the intention of going to the Hedjaz, from proceeding either to Madras or to Calcutta in order to embark for the pilgrimage. Instructions were at the same time given that all persons who had arrived in the Bombay Presidency and refused to abandon their intention of proceeding on the pilgrimage should be detained under observation in some place in the Bombay Presidency, and that until arrangements had been made for this detention no intending pilgrims should be allowed to leave Bombay. It was further suggested to the Government of Madras that they should issue orders, similar to orders already issued by the Government of Bengal, for the continuous medical observation, for at least seven days, of all persons desiring to sail from Madras to the Hedjaz, at an appointed place at some distance from the port. The Government of India hoped that the adoption of these measures would prevent large bodies of pilgrims coming from Bombay to Madras or Calcutta, that it would ensure that any pilgrims who did come from the Bombay Presidency were free from plague, and that it would

Precautionary instructions issued by the Government of India. Detention of intending pilgrims in an observation camp in the Bombay Presidency.

secure the ports from contamination and from being quarantined. Only about ten per cent. of the pilgrims who sail from Bombay belong to that presidency; the great majority are natives of the north of India and of countries lying beyond the frontier.

Further protests from Madras and Bengal.

The Government of Madras were not satisfied that these precautions would suffice, and renewed their request that the embarkation of pilgrims from Madras should be altogether prohibited. Similar protests were received from the Government of Bengal and various public bodies in the Lower Provinces. The Government of India were most unwilling to forbid the pilgrimage, and thus interfere with an important religious duty of their Muhammadan subjects. But after consulting the Governments of the territories in the north and centre of India, they issued a notification under the Epidemic Diseases Act, on the 16th February, prohibiting all persons who resided in the Bombay Presidency or Sind or who had entered those territories with the object of proceeding on the pilgrimage, from embarking at any port in British India with the object of making the pilgrimage to the Hedjaz. The Government of Bombay also issued orders prohibiting the sale of tickets to the Hedjaz anywhere in the Bombay Presidency and Sind.

Prohibition of the pilgrimage in the case of persons who had been in the Bombay Presidency or Sind.

Muhammadan traditional law on the subject of plague.

In issuing the prohibition the Government of India took account of the fact that although it is the duty of pious Muhammadans to perform the pilgrimage, yet the traditional law asserts that if a person is in a place where there is plague he should not leave that place, and that if there is plague at the place where he desires to go, and his own country is safe, then he should not leave his own country in order to go to that place.

Precautions to be taken in the case of persons desiring to go on pilgrimage from places outside the Bombay Presidency and Sind.

Dissuasion.

At the same time instructions were issued to the Local Governments and Administrations with a view to remove any risk of infection being carried by intending pilgrims from parts of India outside the Bombay Presidency and Sind. In the first place it was directed that all possible efforts should be made through the Magistrates of Districts, the religious heads of the Muhammadans, pilgrim brokers, and in any other way that occurred to the Local Governments, to dissuade intending pilgrims from going to the Hadjaz during the current season. It was stated that though by these means the number of pilgrims might be materially reduced, it appeared likely that a considerable number might still wish to go on pilgrimage from places other than the Bombay Presidency and Sind. All who persisted in the desire to make the pilgrimage were to be collected prior to departure in camps of observation, distant from the ports, and situated in the province to which they belonged, or, in the case of residents of Native States, in the province nearest to the State. In these observation camps they were to be detained at least seven days and until intimation was

Detention in observation camps away from the ports.

Removal from camp to place of embarkation.

sent that a vessel was ready to receive them. Before leaving the camps the pilgrims, their clothes and effects, were to be disinfected. The pilgrims were to be taken from the camp by special train, railed to the place of departure of the steamer, and there embarked. No tickets were to be sold at Calcutta and Madras, and they were to be purchaseable only at the camps of observation.

Complete suspension of the pilgrimage.

Before effect could be given to these orders, a communication was received from Her Majesty's Secretary of State, in consequence of which the Government of India issued the following notification, on the 20th February, altogether suspending the pilgrimage from India for the current season :—

The prohibitory notification.

"The question of the suspension of the pilgrimage to the Hedjaz having been under the consideration of the Government of India and Her Majesty's Government, Her Majesty's Government have now come to the conclusion that, in consequence of the strong opinion of all European Governments, including Turkey, regarding the danger of plague being communicated to Europe, it is impossible to meet their demands by any measure short of the suspension of the pilgrimage for the time being.

"The Governor General in Council is therefore pleased, under section 2, sub-section 1 of the Epidemic Diseases Act, 1897, to order that the pilgrimage to the Hedjaz shall be altogether suspended for the current season."

Making public the causes which led to the suspension.

Local Governments and Administrations were informed that it was essential that the reason for the decision of Her Majesty's Government, indicated in the notification quoted above, should be made widely known by the officers of the Government, and that every endeavour should be made by the agency of Muhammadans of position and trust to explain the circumstances to those who had intended to proceed on pilgrimage and to Muhammadans generally. It was further explained that it was necessary to stop all intending pilgrims near their homes and on the frontiers of British India and to induce them to return to their homes, so that they might not gather in large bodies.

## Return of intending Pilgrims to their Homes.

The pilgrimage having thus been suspended, the next point to notice is the arrangement made for the return of the intending pilgrims to their homes.

Detention in an observation camp of intending pilgrims who had come to Bombay.

With a view to prevent the dissemination of plague by intending pilgrims who had been in infected localities, the notification of the 16th February forbidding the pilgrimage from the Bombay Presidency and Sind provided that all persons who had entered those

territories with the object of proceeding to the Hedjaz, should be placed in a camp of observation until the medical officer in charge was satisfied that all risk of the occurrence of plague amongst them had been completely abated. They were then to be sent to their homes, the railway expenses of their journey being paid by the State. On the date that the notification issued, telegraphic instructions were sent to the Government of Bombay to cause all pilgrims then in Bombay to be conveyed at once to an observation camp at Nasik, in the district of the same name, there to be detained for ten days from the date of arrival, or if plague occurred among them, until they had been free from it for ten days. It was further stated that when certified fit for removal from camp the pilgrims should be separated into batches according to the provinces of their origin, and each batch taken under the charge of a responsible officer of the Government of Bombay and by him handed over to an official to be named, and at a place to be fixed, by the Local Government to whose territories the persons composing the batch belonged. Orders to the same effect were issued to the other Local Governments and Administrations. At the request of the Government of Bombay, the instructions were subsequently modified and it was directed that the charge of the pilgrims should be taken over by the officers appointed by the Local Governments at the observation camp itself.

Despatch from camp to their homes.

Observation camp at Nasik.

Arrangements for return.

Some of the intending pilgrims had returned up-country before the orders for their detention issued, and some others eluded detection, but the bulk, 485 in number, were despatched under escort from Bombay to the observation camp at Nasik by a special train on the morning of the 22nd February. They were subjected to a strict medical examination before departure, at which three persons were rejected. The isolation camp was established near a small village about a mile and a half from the Nasik railway station. The site was in open country and on the bank of a river which furnished a good water-supply. The pilgrims were accommodated in a number of sheds erected for the purpose, and arrangements were made by the local authorities for sanitary arrangements and the supply of food free of charge. The camp was in the charge of a commissioned medical officer assisted by several subordinates. The Protector of Pilgrims also accompanied the pilgrims to the camp. A police and military cordon prevented any communication between the camp and the outside world.

Despatch of pilgrims to the Nasik camp.

Arrangements at the Nasik camp.

All went well in the camp until on the 26th February a pilgrim was suspected to be suffering from plague and was immediately isolated. The alarm of plague turned out to be unfounded as the man was discovered to be suffering from small-pox. No other case occurred and the pilgrims were in due course sent off by special trains to their

Despatch of the pilgrims from the camp to their homes.

respective provinces after they and their effects had been disinfected. The first batch left on the 8th March.

Pecuniary concessions made to inteding pilgrims.

In order to lessen the disappointment of the intending pilgrims and as some compensation for the detention and inconvenience to which they were subjected, the Government, in addition to sending them home free of charge, repaid to them (at the treasury nearest their homes) the cost of the tickets which they had purchased for the passage to Jeddah. A number of poor pilgrims from Northern India who were stopped at Calcutta were also paid the price of a third class railway fare from Calcutta to their homes. Some others, finding the pilgrimage from Bombay stopped, purchased tickets at Bombay for use at Calcutta and then, eluding the police, and travelling to Calcutta in order to embark at that port found that they were again prohibited from sailing. The Government refunded to them the price of their tickets.

Central Asian pilgrims.

About one hundred and fifty Central Asian pilgrims were despatched from the Nasik camp to Peshawar. They petitioned to be permitted to remain in India until the next pilgrimage. Some amongst them had spent a life's savings in preparing for the pilgrimage and were most averse from returning. The permission was granted, and in addition indigent pilgrims from Central Asia who did not desire to stay in India were granted Rs. 30 each for the return journey and a certificate stating the number of days during which they had not been in an infected locality and that they had passed ten days in an observation camp before leaving the infected area.

## The return of the Pilgrims from Jeddah.

Many pilgrims left for the Hedjaz before the prohibition.

Before the issue of the orders suspending the pilgrimage a considerable number of pilgrims had already gone from India to the Hedjaz, and when the time of the return pilgrimage approached, it became necessary to make arrangements for the reception of the pilgrims, with a view to prevent their taking infection on landing and spreading it to other parts of the country. It was ascertained from Her Britannic Majesty's Consul at Jeddah that three thousand pilgrims were likely to return to India by five ships, of which the first was timed to sail on the 20th May. Fortunately the plague in the City and Presidency of Bombay had by this time greatly diminished and the danger to be anticipated from the returning pilgrims was thus greatly lessened.

Arrangements necessary to prevent their spreading infection on return.

Despatch from Bombay by special trains.

It appeared, however, to the Government of India to be essential that the returning pilgrims should not be permitted to mix with the population of the still infected part of the country before making their way to their homes. Arrangements were therefore made under

which the Consul at Jeddah telegraphed information of the departure of each pilgrim ship for Bombay and the number of pilgrims on board divided into the following classes :—

(*a*) Those proceeding by the Great Indian Peninsula Railway in a south-east direction ;

(*b*) those proceeding by the same railway in a north-east direction ;

(*c*) those proceeding by the Bombay, Baroda and Central India Railway in a northerly direction ; and

(*d*) those proceeding by steamer to Cutch, Kathiawar, and Sind.

On arrival of the vessel the pilgrims were taken direct to special trains and despatched to their destination without being permitted to mix with the inhabitants of Bombay. Those amongst them who were unable to pay for their tickets were given a ticket free of charge. The Local Governments concerned were informed of the despatch of each batch of pilgrims.

Return of the *Sultan*, *Naseri*, and *Pekin*.

The S S. *Sultan*, the first of the return vessels, brought 60 Bokhara pilgrims to Calcutta. The S.S. *Naseri* followed on the 26th May and the S.S. *Pekin* on the 28th. Both vessels brought pilgrims of all classes to Bombay, and the *Pekin* also brought pilgrims for disembarkation at the port—Calcutta. The Calcutta pilgrims were not allowed to land during the stay of the vessel at Bombay. For the treatment of pilgrims at Bombay a special resolution was issued by the Government of Bombay under the Epidemic Diseases Act. The master of the ship was required to report at once to the Health Officer of the Port, to anchor in the stream,* and to prevent any persons from disembarking until he received permission. The pilgrims were required to give their names and addresses and to mention their intentions regarding future movements, and the Commissioner of Police was empowered to arrange for the detention of the pilgrims on board or on shore until arrangements were made for their removal from Bombay by road, rail or sea.

Treatment of pilgrims at Bombay.

Outbreak of plague at Jeddah.

On the 10th June the Consul at Jeddah telegraphed that plague existed at Jeddah, and on the 11th the Government of Bombay informed the Government of India that the existence of plague in the Hedjaz having been officially declared, quarantine in accordance with the Venice Convention Regulations had been enforced in Egypt. The disease was first observed amongst pilgrims from Hadramaut, and from them it spread to the inhabitants of the place. No Indian pilgrims were attacked, and there is no reason to believe that the infection was brought from India. Fortunately the outbreak was mild and of short duration. The last cases occurred at the

Short account of the slight epidemic.

* The outer portion of the harbour.

beginning of July. From the 10th June, when the plague was officially declared to exist, up to the end of the month the number of reported deaths from plague was 46, and 220 deaths were returned from other causes. Both in May and June the total mortality was much above the normal, and during these two months the number of deaths from plague must have considerably exceeded 46, without however mounting to any considerable figure. Stringent precautionary and remedial measures were taken by the sanitary authorities under the superintendence of a medical commission sent by the International Board of Health at Constantinople. On the 20th June about 1,500 poor and destitute pilgrims, found wandering in the streets without shelter, were removed to and segregated in the islands of Abu Saad and Wasta, where accommodation and food was provided for them free of charge.

Jeddah treated as an infected port under the Venice Convention. and special precautions taken to prevent the spread of infection by returning pilgrims.

On learning of the existence of plague at Jeddah, the Government of India directed the Governments of Bombay and Bengal to enforce against the Hedjaz the regulations prescribed by the Venice Convention, and to adopt careful precautions to prevent returning pilgrims from carrying infection. As the voyage from Jeddah takes more than ten days, it was considered sufficient, in the case of healthy ships, to carefully disinfect the clothing and baggage of the persons on board and the vessel. Discretion was given to burn old and dirty clothing, fresh clothing being supplied free of charge. The port authorities were directed to subject the vessel to a searching examination and to take a declaration from the doctor on board that no case of plague had occurred. The Local Governments of the provinces to which the pilgrims belonged were informed of the despatch of pilgrims and furnished with a list of them, with a view to a watch being kept over their health for a few days, at their own homes. Special instructions were also given for the treatment of infected vessels, but as no case occurred on any of the ships, it did not become necessary to put these instructions into execution.

Arrangements at Bombay.

At Bombay arrangements were made to land the pilgrims from healthy ships at Malet Bunder, where their baggage was disinfected, and, after medical inspection, they were despatched to their destination without communicating with the city. The Government of Bombay forbade for a time the disembarkation of pilgrims at Karachi.

Discontinuance of the precautionary measures.

On the 12th August the Government of India, having learned that quarantine against Jeddah had been removed in Egypt and that the place was free from plague, directed that the precautions should be discontinued and that Jeddah should be treated as a healthy port.

# CHAPTER XVI.

## CONCLUSION.

Several lessons of the first importance are to be derived from the recent experience of plague in India. The most important of all is that plague is no longer the irresistible scourge of former times. Modern scientific investigation by disclosing the cause of the disease and the manner of its growth, has indicated the means by which it may be repressed, and experience has shown that the prompt adoption of those means is certain to meet with at any rate enough success to rob the pestilence of much of its terror. The malady remains a virulent and dangerous one, but it has been found that careful nursing and healthy surroundings give the patient a chance of recovery greater than would have seemed possible during the epidemics of former days. The infection, it has been discovered, does not lurk in the atmosphere, a mysterious and irresistible enemy, but spreads according to simple natural laws, and can be fought by the prompt adoption of the measures dictated by science, common sense, and experience.

**Lessons to be derived from the recent experience of plague.**

Sanitary and well ventilated dwellings and cities, containing ample space for their inmates, are the conditions which render the spread of plague practically impossible. Crowded and filthy surroundings, insufficiency of air and light, and dirty habits of life are the fostering causes of the disease.

**Conditions which foster and which destroy the infection.**

When plague breaks out in any place, the measures best adapted to suppress it are—

**Measures best adapted to suppress plague epidemics.**

(*a*) The prompt detection of cases by carefully enforced death registration, house-to-house visitation, and such other means as are found practicable.

(*b*) The segregation of the sick and their careful nursing and treatment in well-ventilated and sanitary hospitals.

(*c*) The segregation, after disinfection of clothing, bedding, etc., under medical supervision and in sanitary surroundings, of the persons who, by association with the sick, have been especially exposed to the risk of infection.

(*d*) The evacuation of infected houses and localities, the inmates being lodged in carefully supervised health camps.

(*e*) The thorough cleansing and disinfection of infected houses and localities before the inmates are permitted to return.

(*f*) The enforcement of general sanitary precautions, such as extensive cleansing of dwellings, freer admissions of light and air, destruction or modification of insanitary buildings, improvement of drainage and conservancy, abatement of overcrowding, and opening out of congested localities.

**Evacuation and disinfection.**

These measures are based on scientific knowledge, and experience shows that they are certain to meet with a large measure of success. In especial, if the inhabitants of an infected locality can be removed from their dwellings and located, after disinfection, in a healthy encampment under medical supervision, the epidemic amongst them will be almost immediately arrested. And if the infected locality is thoroughly cleansed and disinfected, and its sanitary condition overhauled, the return of the inmates will not occasion a fresh outbreak of the disease.

**Special difficulties in India.**

In India the customs and prejudices of the people offer a more or less important obstacle to the adoption of the measures which have been found best adapted to check the disease. The responsible authorities have to consider how far they can be carried out in any locality. Tact and firmness have, however, generally succeeded in overcoming opposition and winning the sympathy of the people in whose best interests the precautions are taken.

**Prevention of the spread of infection by land.**

Quarantine should not be enforced to prevent the spread of infection by land. It occasions hardship and distress, it is unlikely to be successful, and it even assists the spread of infection by fostering the growth of virulent centres of disease. Systematic and thorough arrangements should be made for the inspection of travellers from infected localities, for the segregation of suspicious persons, for the isolation and treatment of plague-stricken travellers, for the disinfection of all baggage likely to contain the seeds of infection, for the surveillance of travellers from infected districts on arrival at their destination, and for a watch over the general health of the country, and especially of those parts known to have communication with the infected area. The infection of plague from isolated cases spreads slowly, and the prompt adoption of measures of segregation and disinfection will always serve to prevent such cases from creating a new centre of disease.

**Prevention of the spread of infection by sea.**

Vessels from infected ports should be dealt with in accordance with the principles laid down in the Venice Sanitary Convention of 1897. The antiquated system under which the sick and healthy were detained together on boardship should never be employed. In the case of infected ships the sick should be landed and segregated in hospital, and the healthy should be landed and detained under medical supervision in properly constructed shelter, or should be

subjected to surveillance at their destination, until the period of incubation is over. The outward bound sea traffic should be vigorously inspected, and persons suffering or suspected to be suffering from plague and their companions and attendants should be prevented from sailing.

Prevention of the spread of infection by merchandise and food-stuffs.

The spread of infection by merchandise plays, it is believed, a very subordinate part in the dissemination of plague. There are not many articles of commerce likely to be contaminated or to retain the germs of infection. The importation of the most dangerous of such articles, such as rags, from infected localities should be altogether prohibited. The possibility of infection being carried in contaminated food-stuffs is recognised, and precautions should be taken to prevent the sale and export of grain and other food-stuffs open to the suspicion of being contaminated.

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