

Report on the causes and continuance of plague in Hongkong and suggestions as to remedial measures / by W.J. Simpson, M.D., F.R.C.P.

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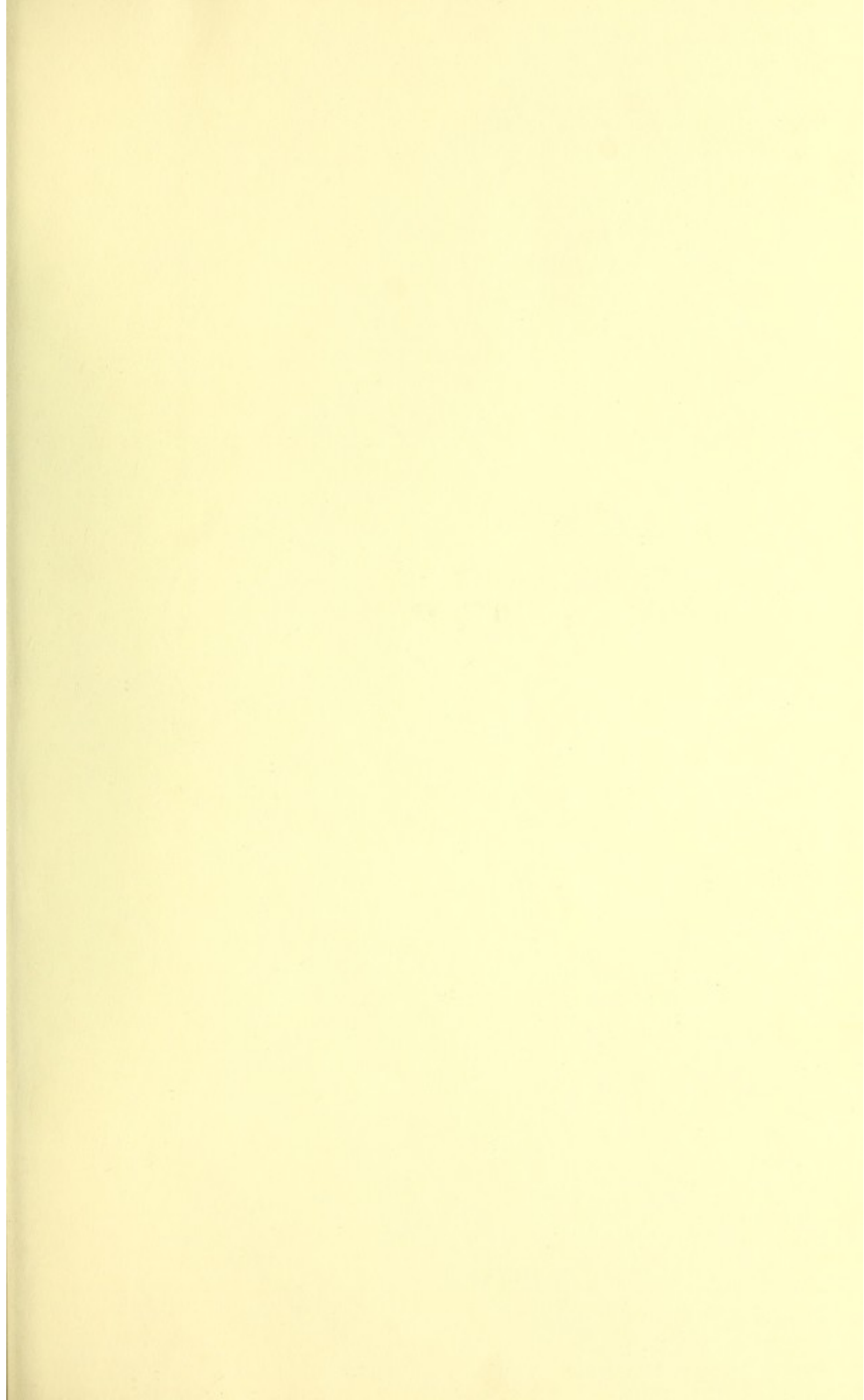
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HONGKONG.

Report

ON THE

CAUSES AND CONTINUANCE

OF

PLAGUE IN HONGKONG

AND

SUGGESTIONS AS TO REMEDIAL MEASURES.

BY

W. J. SIMPSON, M.D., F.R.C.P.

LONDON:

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1903.



HONG KONG

Report

GARRISON AND COMPANY

PLAQUE IN HONGKONG

HONGKONG AND THE TREATY PORTS

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Report

ON THE

CAUSES AND CONTINUANCE

OF

PLAGUE IN HONGKONG.

TO THE RIGHT HONOURABLE

JOSEPH CHAMBERLAIN, M.P.,

SECRETARY OF STATE FOR THE COLONIES.

SIR,

1. In accordance with the instructions given me "to visit the Colony of Hongkong to investigate and report upon the causes and continuance of Bubonic Plague therein, and to advise remedial measures," I have the honour to report that I arrived in Hongkong on January 5th, 1902, and left on July 10th.

During my stay in the Colony every facility was afforded me by the Government of Hongkong to prosecute my inquiries, and any remedial measures I suggested were promptly carried out. Before I left a gradual organization of methods was effected on the lines which I consider necessary to be followed in order to combat plague.

I am happy to be able to record that with the exception of 1895 and 1897, which were non-epidemic years and the statistics of which are not comparable with those of other years, the outbreak of 1902 was remarkable as the lightest since 1894, while the usual concomitants, such as panic and flight of the Chinese, with scarcity of workmen, disturbance of trade, and serious business losses, have been conspicuously absent.

2. As the scope of my commission was somewhat wide in its terms, and the time at my disposal limited, it was necessary to confine my investigations to the more obvious practical points, and for this purpose three lines of research were undertaken, to ascertain, *firstly*, the extent of the prevalence of plague in Southern China, a country with which Hongkong has large commercial relations; *secondly*, the behaviour of plague in Hongkong, the conditions

which favour its spread and continuance there, and whether, as in Cape Colony, rat plague is intimately connected with, and precedes as a rule, human plague; and *thirdly*, whether other animals besides rats are affected with plague, and if so the mode by which they become infected.

On the answers to these questions necessarily depend, in a great measure, the remedies to be suggested, bearing always in mind the local conditions which almost invariably modify the extent to which, and the mode in which, general principles can be put into practice in different places.

It was soon obvious that Southern China had not been for years free of plague, and in order to acquaint myself personally with the social life of the Chinese in the province nearest to Hongkong, viz., Kwantung, and the conditions under which plague spreads among them, I visited Macao in Portuguese territory, Canton, Swatow, Chaoyang, and a number of Chinese villages. A visit of this kind would have lost most of its value had it not been for the generous assistance rendered me by the local medical men, the officials of the Chinese Imperial Customs, and the different Consuls. Further, in order to gain more information regarding plague in China than a short visit to a few places could furnish, I addressed a circular letter asking certain questions on the subject to the medical men and medical missionaries in China, who, on account of their intimate connection with the Chinese, are in the best position to know what epidemics are prevailing in the districts over which they have charge. A considerable number favoured me with answers.

It is with much appreciation of their services and the value of the information so willingly and freely given that I append their answers to this report.

The second line of research involved a study of the cases of plague in Hongkong as they occurred, a careful inquiry into the circumstances connected with them, and the past history of the houses. In this I was fortunate in securing the cordial co-operation of Dr. Atkinson, the principal medical officer for the Colony, of Dr. Pearce, the assistant medical officer of health, and of Dr. Francis Clark, the able medical officer of health for the Colony, whose knowledge of the sanitary conditions of Hongkong is unrivalled, and whose untiring energy to improve the health of the City of Victoria under great difficulties is deserving of the highest commendation.

The investigation into plague in animals was conducted by the institution of a series of experiments. I had the advantage here of having associated with me Dr. William Hunter, the recently appointed bacteriologist to the Colony, whose technical skill and careful work were extremely useful, also Mr. Gibson, the Colonial veterinary surgeon, and Dr. Matsuda, the chief of the eight Japanese medical men, whose services were requisitioned from Japan for medical work connected with plague. My thanks are due to these gentlemen, especially to Dr. Hunter, for the assistance I received from them.

3. The report now submitted is divided into four parts.

Part I. deals with plague in China—

(a.) Before the outbreak in Canton in the spring of 1894.

(b.) During and after the outbreak in Canton in 1894.

Part II. treats of plague in Hongkong.

Part III. records the results of the investigation into plague in animals.

Part IV. suggests remedial measures.

4. The main causes of plague and its continuance in Hongkong may be summarised as :—

(1.) Importation of plague from China, especially during the early months of the year.

(2.) The endemic maintenance and dissemination of the disease by infected rats, infected houses, and infected clothes. Hongkong, owing to its being an emporium for grain and other goods, has an enormous number of rats.

(3.) The insanitary and overcrowded condition of most of the Chinese houses, with an exceptional amount of darkness and bad ventilation of the rooms.

(4.) The absence of a special staff to combat the disease, and to trace the history of, or even to their homes, cases of plague, many of which are dumped in the streets when dead or dying.

(5.) The facility with which infected food may be imported into the Colony, combined with insufficient cooking of food by the lower-class Chinese. This, however, it should be added, is rather a suspected than attested cause, and needs more facts for confirmation than I had time or opportunity of collecting.

5. In connection with importation of plague into the Colony, the report shows that Southern China originally infected Hongkong, and that, as this part of China is annually more or less infected with the disease, it forms a dangerous centre close to the Colony, and a constantly menacing source of fresh infection. The liability to re-infection of the Colony is favoured by its proximity to the Kwantung Province, and the intimate intercourse that exists between the two. Situated near the mouth of the Pearl River, Hongkong is less than 80 miles from Canton, the capital and chief commercial city of Kwantung, with which it is in constant daily communication by junk and steamer, and such is the traffic between Hongkong and Canton, and the villages in and near the Delta, that at least half a million passengers travel each way to and fro during the year, and 80,000 coolie emigrants, men and women, come to Hongkong to be finally shipped to other lands for work.

The population of Hongkong is chiefly Cantonese, drawn from the villages in the neighbourhood of Canton, the West River, and the Delta ; it is dependent on the Kwantung Province for its food supply, and observes the

same festivals, large numbers visiting China at certain periods of the year, more especially in the spring. Besides this intimate relationship with the Province of Kwantung, Hongkong is the chief commercial centre and emporium for Southern China.

6. Apart, however, from the exposure of the Colony to re-infection from the mainland of China, plague is now endemic in Hongkong. Since 1898, no two consecutive months have been free of plague, and there has been a yearly recrudescence in the spring which gradually increases in epidemic force until it reaches its climax in June or July, and then rapidly decreases.

This endemicity owes its maintenance to :

(a.) Infection among rats, probably often connected with infectious material in rat runs or in houses, the virus of which has not been destroyed ;

(b.) Retention of infection in houses which are rat-ridden, or which have escaped disinfection because of the plague patient who occupied the house having been taken to China or dumped when dead or dying into the street, or which could not be efficiently disinfected, because of the darkness and insanitary condition of the infected house ; and

(c.) Infected clothing of people who have been ill or who have died of plague, and whose effects have been removed to some other house without disinfection.

On the other hand, the recurrent outbreaks and epidemic prevalence are favoured by :

(a.) The seasonal heat and moisture of the spring and early summer.

(b.) The movement from place to place of infected rats and persons.

(c.) The general insanitary condition of the interior of a great number of the Chinese tenement houses, the rooms of which are dark, damp, badly ventilated, and grossly overcrowded.

(d.) The high proportion of the population which is poor, living in tenement houses, and whose habits, dwellings, persons, and mode of preparation and storage of food are not at all cleanly ; who at the same time are not permanent residents, and whose susceptibilities to endemic diseases are accordingly greater than those of a more residential population. New comers are specially prone to plague when freshly exposed to infection in insanitary houses.

7. The social scale and floating nature of the population, like the seasons, are not alterable. They are mentioned as subsidiary influences because their recognition as agents fostering an epidemic is not without its uses, inasmuch, as it draws attention to the special localities and classes of

population most likely to be attacked, to the movement of these classes, and to the time to prepare for an outbreak.

8. As in Capetown, so it has proved in Hongkong, that nearly always there is an infection of the locality by infected rats before cases of plague occur among human beings, and it was by the organization of a daily bacteriological examination of the rats collected in different parts of the town and subsequently taking prompt action thereon whenever infection was found, that some of the worst localities were kept comparatively free of plague. The practice thus instituted was not to wait for plague to occur in human beings but to take action in advance and deal with the precursors of plague.

9. The circumstances which have contributed to the erection of insanitary houses are explained in the preliminary reports submitted to the Government of Hongkong, and a more detailed description of the defective mode of construction is given in the conjoint report by Mr. Osbert Chadwick, C.M.G., and myself. Mr. Chadwick was commissioned at the same time as I, to inquire into the sanitary condition of the Colony, more particularly with reference to the water supply and drainage, and during his stay in the Colony we worked together on the different sanitary problems. The insanitary and overcrowded condition of the Chinese tenement houses is due partly to the limited area of building land which was available in the early days of Hongkong, and partly to the defective mode of construction of the houses and the pernicious subdivision of the rooms into separate dwelling houses for separate families without reference to the free access of light and fresh air.

The Colony of Hongkong was not always the size which it is to-day. At first there was only the Island of Hongkong on which the City of Victoria was built. Later a small strip of the mainland on the opposite or Kowloon side of the harbour was acquired, and it is only within the last four years that the boundary has been pushed back and extended inland so as to include an area of land some 20 miles broad. The conformation of the site on which the City of Victoria stands, with its rapid rise of land near the sea-shore up to a height of some 1,700 feet, led in the early days to the erection of houses on the small strip of land near the harbour, and extending some distance up the hill, these houses being separated only by narrow lanes and alleyways. At the time when the population was small, and the houses only one or two stories in height, it is probable that no harm resulted from this practice. But when different conditions arose, and the houses were heightened, and the rooms subdivided into cubicles without windows, in order to provide for the rapidly increasing population, a dangerous concentration of population to the extent of 600 to 800 persons per acre resulted, and the areas and houses so treated have become extremely insanitary. It is chiefly in the City of Victoria that these conditions

exist, but even in Kowloon, with wider streets, the tendency to provide insufficient air space between the backs of houses, and to continue the subdivision of rooms into cubicles without windows, is common.

10. The experiments undertaken demonstrate that pigs, calves, buffaloes, sheep, hens, ducks, geese, turkeys, and pigeons are, in addition to rats, susceptible to plague, and particularly so when fed with plague material.

The Chinese have generally maintained that these animals and birds suffer from plague, and evidently their observation, as in many other instances, is correct, though their theories as to causation need not be considered.

That these animals of the farmyard and of the backyard of domestic dwellings are affected with plague is an important fact bearing on the continuance of plague in some localities where these animals are numerous; while the fact that they take plague by feeding has to be borne in mind in any future consideration of the different modes by which the virus of plague gains an entrance into the human body. The view that plague is mainly acquired by inoculation will probably have to be modified in the light of these experiments, and the swallowing of infected food or drink, in whatever way that food or drink may become infected, will have to take a more important place in the recognised modes by which the virus infects the body. More attention than has hitherto been considered necessary will require to be paid by the local authority in times of plague epidemics to the examination and inspection of the food supply, and by private individuals to the cooking and storage of food. It is highly probable that the dissemination of the disease by plague rats is due, in a large measure at least, to their infecting food which has been lying about or to which they have gained access.

There is a twofold reason for keeping food covered and the house clean. One is in order that rats, among which some may be infected, shall not be attracted; the other is that the food to be afterwards eaten by the household shall not be infected by plague-stricken rats. The experiments on monkeys show that rat plague is communicable to the higher animals by infected food or by inoculation with the virus, or by contact, or even without contact, with the infected rat.

In connection with these experiments and what they show, it is instructive to note that in nearly every description of an endemic centre of plague the people live crowded together in dark and badly ventilated huts along with their cattle, pigs, and poultry.

11. The remedial measures advisable were considered and generally accepted in principle by the Government before I left the Colony. They are mostly concerned with the administration and with the legal powers necessary to combat the plague and improve the sanitary condition of the Colony, and consist in:—

(a.) Notification of plague from China by WEEKLY BULLETINS from Consuls, &c., (see Part IV., page 105).

(b.) The inclusion of a special plague organization in the sanitary administration.

(c.) A re-organization of the sanitary department to include medical inspection of shipping and junks and the appointment of a Sanitary Commissioner for the Colony.

(d.) The amendment and consolidation of the Public Health Ordinances.

Under the present condition of Hongkong and with Southern China infected extensively with plague, it is almost hopeless to expect Hongkong to remain long entirely free of plague, but it is not impossible, with a trained and special organization, to keep the disease in check and under control, so as to prevent it reaching those dimensions which alarm the population, prove disastrous to the Colony, and render Hongkong a source of anxiety to those who have trade relations with it.

12. The preventive measures against plague are of such a character that they cannot be effectively carried out by the ordinary sanitary staff employed for conservancy and inspection of nuisances. The campaign against rats, involving the preparation and distribution of poison or of *Danysz bacillus*; the bacteriological examination of rats to discover which are infected and the house or street from which the infected are brought; the bacteriological examination of dead bodies; the rendering of old, dilapidated, and rat-ridden houses rat-proof; the seeing that ships have proper appliances fixed to them to prevent rats passing from ships to the shore or from the shore to ships; the destruction of rats on ships arriving from an infected port, and on certain ships leaving Hongkong; the discovery and tracing out of cases of plague; the removal of plague patients to hospital; the inoculation of those who wish to be protected with Haffkine's plague prophylactic; the provision of temporary accommodation for the healthy inmates of a plague-infected house; the cleansing and disinfection of a plague-infected house and plague-infected clothing; the inspection of emigrants and the disinfection of their personal effects before leaving the port, and a series of other duties, require special officers and a special establishment for their execution.

The Government have already taken steps to organize a small but permanent staff trained in the work. For the medical duties endeavours were made in the early part of the year to secure from India eight medical men of the class of assistant surgeons, but in consequence of the extensive prevalence of plague in India they could not be obtained. Later the services of eight Japanese medical men were secured on the understanding that they were conversant with the English language. Unfortunately those sent proved, with one exception, to possess but a very small knowledge of English; and, as it was difficult to provide interpreters who knew English, Chinese, and Japanese,

they could not be employed as district medical officers, and, accordingly, four of them were returned to Japan, four being retained for bacteriological examination of rats.

There is a Chinese College of Medicine in Hongkong, and it appears to me that the Government might with advantage secure the services of as many graduates as it may require instead of allowing them to leave the Colony for Singapore, the Malay Peninsula, and other places. If pains are taken in training them to plague work they will, under European supervision, do good service; and, as they possess a thorough knowledge of Chinese and speak and understand English, more early and reliable information is likely to be gathered by them than is possible at present.

This year a Chinese medical man who had been trained in America was engaged to attend the Chinese in the plague hospital, and it was found that several that objected to be removed to hospital no longer objected when they understood they would be attended by a countryman of their own.

13. In addition to the foregoing special organization for plague work under the direction of the medical officer of health, the sanitary administration of the Colony requires to be placed on a wider basis in order that the complicated and urgent health problems which always arise in a thriving and expanding commercial centre shall be economically and successfully dealt with.

Though the trade and population of Hongkong have grown marvellously during the past few decades, yet those who are in a position to form a just opinion are unanimous in believing that the Colony is only in its infancy as regards growth and importance. Merchant, soldier, and sailor, each looking at the future prospects of Hongkong from his own point of view, have confidence in its rising greatness.

It is evident from the condition of Hongkong that the sanitary administration has not been able successfully to cope with the forces which make for deterioration and disease. Since the advent of plague in 1894, much has been done to improve it, but a good deal still remains to make it efficient.

The most noticeable feature in regard to sanitary matters in Hongkong is that no one is responsible. Independence of action by different officers and absence of co-ordination tend to spasmodic action and inefficiency. There is a Sanitary Board and a President, who meet at stated times and discuss public health matters, but their functions are advisory. There is the medical officer of health and assistant medical officer of health for the Colony, whose duties are executive, but there is no administrative head who is responsible to the Government for the conduct of health matters in the Colony and for the maintenance of a continuous and progressive policy.

It is advisable that all municipal health matters be brought more or less under one department, controlled by a sanitary or health commissioner who would be the administrative officer. There is more than ample work to occupy

the whole time of such an officer. In addition to being President of the Sanitary Board he would administer the several branches of the Public Health Department, dealing with the health questions relating to water supply, sewerage, and drainage; alignment and laying out of streets and back lanes; the prevention of the crowding together of new houses, or the formation of new unhealthy areas; the scrutiny of plans of new houses, and the enforcement of compliance with the requirements of health, the preparations of schemes for the consideration of Government in connection with the demolition of insanitary areas, and the re-construction on sanitary lines; the provision of markets, public latrines, urinals, bath-houses, &c.; and the general enforcement of the Public Health Laws. Lastly, he would be responsible to Government for the efficient working of the Department, and, like the Director of Public Works, should have a seat on the Legislative Council. Mr. Osbert Chadwick, C.M.G., is also strongly of opinion that a Sanitary Commissioner is required.

14. At the request in Council of Sir William Gascoigne, K.C.M.G., the officer administering the Government of Hongkong, Mr. Chadwick and I, assisted by Dr. Clark, the Medical Officer of Health for the Colony, drafted a Public Health Bill which amends and consolidates the Public Health Ordinances of Hongkong. It gives more control over buildings and the laying out of streets, and greater power with reference to the prevention of overcrowding. The principles of this Bill have been in the main accepted by Government and doubtless will soon become an Ordinance.

With this Act in force, and a Public Health Department organized on the basis recommended, with a Sanitary Commissioner as its administrative head, the Government will be able, not only to cope with plague, but will be gradually able to improve the sanitary conditions of the Colony and to prevent in the future those conditions arising which have in the past proved detrimental to its health.

I have the honour to be, Sir,

Your obedient Servant,

W. J. SIMPSON, M.D., F.R.C.P.

December 22nd, 1902.

PART I.

PLAGUE IN CHINA.

(a.) BEFORE THE OUTBREAK IN CANTON IN THE SPRING OF 1894.

The origin
of many
infectious
diseases
attributed to
China.

1. China possesses an unfortunate reputation for being the source of many epidemic diseases which have invaded the West, but it must be admitted that this evil reputation is based on very slender grounds, as most of the accounts concerning infectious and contagious diseases having originated therein are based more or less on rumour or conjecture. It could not be otherwise, for the immensity and isolation of China have always rendered it a *terra incognita*.

Northern
China credited
as source of
Black Death,
but evidence
weak.

2. The plague of the 14th century, called in subsequent history the Black Death, which ravaged Europe and which was the most destructive pandemic known in history, was set down by the inhabitants of the West of that period as coming from Cathay. In those days, when most of the trade from the East was overland, the caravans were one of the means of transporting disease from place to place, and it is supposed that the infection of plague was brought in the caravans conveying the merchandise from Northern China along the great northern trade routes between the East and the West. Whether the pandemic of the 14th century began in China and extended thus to the West, or whether it began in India or some adjacent country, there is at present no evidence to furnish an answer. Chinese records, so far as is known, are silent on the subject. From Chinese authorities I gather there is no allusion to any great plague at that time either in Northern or Southern China. Not that any importance can be attached to the absence of entry in the chronicles, because loss of life from disease in China, unless on an enormous scale, is not likely to attract attention and become the subject of record.

In 1346, Southern China seems to have been free of plague in its large centres, otherwise the disease is likely to have been referred to by Ibn Batuta, the great Moorish traveller, who was there in that year, and who on his voyage home met with the plague in Damascus and describes its great mortality in that city.

Existing
pandemic of
plague sprang
from Southern
China.

3. As regards the source of the existing pandemic of plague, there is not the same uncertainty. The disease sprang from Southern China, where it has prevailed in an endemic form for sixty years or more. It is possible to be definite on this point in consequence of a better knowledge of Southern China which is contemporaneous with the freer admission of foreigners into the interior, first brought about by the influence of the British. Since the acquisition of Hongkong in 1841, and the subsequent opening of the treaty ports to commerce in 1860, a vast change has occurred in the relationship of China and Europe. In addition to increased trade at the commercial ports a host of missionaries, explorers, and merchants have penetrated into the

interior of the country and reached parts which no foreigner had previously visited. They have given accounts of their experience, with the result that, though the interior of China as a whole and its internal affairs are still veiled from foreigners, yet much more is known concerning important events occurring there than ever before. A favourite province for exploration was Yunnan, because of its proximity to Burma, Siam, and French Annam, its reputed richness in minerals, and its possibility of becoming a highway to Western and Central China. The sixties and seventies of the 19th century were remarkable for the number of intrepid travellers who traversed Yunnan and other parts of China. Lagrèe, Garnier, Cooper, Sprye, Sladden, Dupuis, Rocher, Richth, Margary, Grosvenor, Baker, Gill, and later Colquhoun and Bourne, all distinguished themselves as modern pioneers.

4. It was during one of these explorations, that M. Rocher in 1871, *i.e.*, over thirty years ago, came across plague in the Province of Yunnan. This province is situated at the eastern confines of Burma and Thibet, has Tonking on the south, the province of Sechuan on the north, and the provinces of Kweichow and Kwangsi on the east. It is very mountainous, with high and fertile plateaux, which rise towards the central portion of the province to between 6,000 and 7,000 feet. Talifu and Yunnanfu, two of its chief cities, are situated on the shores of inland lakes and on plateaux, respectively, 6,400 and 6,900 feet in height.

Plague found to prevail in the Province of Yunnan in 1871. *Vide* Map.

5. The province of Yunnan, isolated by its position and its physical features, has only a limited intercourse with its neighbours and with the treaty ports. There are trade routes connecting Talifu and Yunnanfu with Burma, Thibet, and the Province of Sechuan, but the mountainous character of the country which has to be traversed, and the cost and difficulties of transport, which has to be effected by pack animals, cause them to be little used. Caravans from Thibet pass Li Chiangfu on their way to Ssumao for tea.

Trade routes from Yunnan not numerous.

The trend of intercourse and trade, so far as it is developed, is towards Tonking and the Province of Kweichow, Kwangsi, and Kwantung, where, following the course of the Red River in Tonking and the West River in Kwangsi and Kwantung, the journey can be undertaken in boats for at least some part of the way. Both the Red River and West River rise within the boundary of Yunnan, and form more or less natural trade outlets for the province. The Red River is navigable from Manhao in Yunnan, and passes through Tonking to Haiphong in the Gulf of Tonking. This route, notwithstanding its advantages, has not been a favourite. The West River is navigable from Posé, a small town situated on the borders of Yunnan and Kwangsi away down to Nanningfu, Wuchowfu, and Canton. Even this route has been seldom used further east than Nanningfu. Almost invariably, until recent years, Yunnan goods brought down the West River as far as Nanningfu have, at that point, been taken from the boats and carried across country on pack animals to Pakhoi and more recently to Muiluk. Similarly, goods intended for Yunnan have entered Pakhoi, been conveyed overland to Nanningfu, been there transferred to boats, taken up the river to Posé, and then overland again to the towns of Yunnan.

There is yet another trade route from Yunnan through the Kwangsi Province. It is more northerly than that by Posé, Nanningfu, and the West River, which it, however, joins before this waterway enters the Province of Kwantung. The route is overland, and in an easterly direction from Yunnan to Kingiwon in Kwangsi. It here meets the River Lieou Kiang, and becomes a water route to Lauchaufu, which is a great distributing centre, goods from the west being sent to the Yunnan and Kweichow Provinces, and *vice versa*. At Lauchaufu the route branches into two, one going overland in a north-easterly direction to Kweilin, the capital of Kwangsi, and thence by water due south to Wuchowfu. The other branch is by river, via Tsamchaufu to Wuchowfu.

War, famine,
and move-
ment of
infected
troops
favoured
the spread of
plague in
Yunnan.

6. The Province of Yunnan, at the time of M. E. Rocher's visit, was in a state of rebellion. The inhabitants, chiefly Mahommedans, had risen against the Imperial Government, and such was their power that it took some twenty years to subdue them. The traveller found large tracts of the country devastated or deserted, and everywhere signs of depopulation and of the ravages of warfare, great numbers of the inhabitants having been killed in battle or afterwards massacred. To the miseries of war and of famine were added those of pestilence, the infection of which was often carried by the rival armies from village to village and town to town. What proportion of the depopulation of Yunnan was due to fighting, and what proportion to massacres, famine, and pestilence, is unknown, but their combined effect was to convert a populous and thriving province into a country with a few inhabitants, and one which had to be repopled by immigrants.

Epidemic
preceded by
sickness and
mortality
among rats.

7. That the pestilence was plague there can be no doubt. M. Rocher's description of the disease, and its association with swellings in the armpit, groin, and neck, allow of no other conclusion. His account of the disease is given in the Appendix, with a chart on the Map of Southern China showing the course of the epidemic from town to town in the Province of Yunnan. An earlier but similar account by M. Emile Rocher was translated by Dr. Manson, medical adviser to the Colonial Office, and appears in the "Medical Reports" for the half-year ended 31st March, 1878, published half-yearly by the Inspector-General of the Chinese Customs Service. It will be noted that the first sign of the disease in an epidemic form was a sickness and mortality among rats. How and when plague first came to Yunnan is unknown. It evidently existed there before the Mahommedan rebellion, and it was only the conditions of warfare which brought it markedly into prominence. There are traditions of the infection having being imported from the western frontier of Yunnan, and M. Rocher thinks that it may have been introduced from Burma. Possibly Mahommedan pilgrims returning from Mecca in the early part of the 19th century, when plague was prevalent in Egypt and Arabia, may have introduced it into Yunnan. That this journey was occasionally undertaken is evidenced by the fact that Ma Te-hsing, the high priest of the Mahommedans of Yunnan, and leader of the rebellion, visited Mecca in 1839, travelling from Yunnan to Bhamo by the caravan route, and then by boat to Rangoon, where he embarked in a pilgrims' ship. Having spent some time in the Sacred City,

Ma Te-hsing visited Egypt and Constantinople, and returned in 1846 to Yunnan, by the river of Canton or West River. But against this view of the importation of plague by pilgrims in the 19th Century there is evidence of a fatal sickness having occurred among rats and human beings in Yunnan, as far back as the last decade of the 18th century, which tends to indicate that some portion of Yunnan has been an endemic centre for over 100 years at least.

For the purposes of this report, the question as to whether Yunnan has been an endemic centre for over 100 years is not an important one. It is sufficient to know that plague has existed in Yunnan since 1871. Baker met with the disease in his travels through Yunnan in 1877. Monsr. Fenoullett, Bishop of Yunnan, states that, in 1866, a large portion of the population of Yunnanfu succumbed to plague, and M. Rocher, in a second visit to Yunnan, found that plague began to be known in 1840, but long before that time it had existed in the western part of the province without prevailing epidemically.

8. The first medical account of plague in Southern China is given by Dr. Lowry, of Pakhoi, in 1882, the year he was first stationed there as Medical Officer to the Customs. His "Notes on an Epidemic Disease observed in Pakhoi in 1882" are reproduced in Appendix C, and are extremely valuable because of the very careful and accurate manner in which the disease is described, and because of the comparisons made between it and the plague of Yunnan and of Northern India. Dr. Lowry also observed the mortality in rats which accompanies the disease.

Dr. Lowry of Pakhoi gives first medical account of plague in Southern China at Pakhoi. (See Appendix C.)

He remarks that "in nearly every house where the disease broke out the rats had been coming out of their holes and dying on the floors." The disease was not new to Pakhoi, nor to Lienchow, a city about 12 miles distant. In 1871, Mr. T. E. Cocker, the present Deputy Commissioner of Customs at Hongkong, visited Pakhoi, and at the time of his visit there was a severe outbreak of the disease, accompanied by a mortality, not only among rats, but also among pigs and cattle. Mr. Scott, the present Consul General of Canton, saw cases of plague in Pakhoi in 1879. It was then called the "Yunnan sickness" by the Chinese. Mr. Netten Radcliffe, of the medical department of the Local Government Board of England, in his memorandum on the progress of Levantine Plague in 1878 and 1879 records some important information regarding plague at Pakhoi, derived from Surgeon A. R. Lynch's journal for H.M.S. "Mosquito," on the Chinese Station, 1879. It is accompanied by a map showing the presumed route taken by the plague from Pakhoi to Yunnan; and though the map is doubtless correct in showing the localities affected, it is incorrect as to the direction of the route by which plague spread, which was originally from Yunnan to Pakhoi, and not from Pakhoi to Yunnan.

Dr. Lowry states in his notes that "the epidemic which I have observed in this district does not seem to be an old disease, as it occurred for the first time about fifteen years ago, and since that time has occurred at certain intervals, the last severe outbreak being in 1877. I am told, however, that a few cases occur every year, but my short residence has not given me an opportunity of verifying this statement." Dr. Lowry further states, in reply to some questions

Plague first
appeared at
Pakhoi in
1867.

on the subject, that plague first appeared in Pakhoi in 1867. It is to be noted that this was at a time when the Mahommedan rebellion in Yunnan was in full force and troops raised in Hainan and the Pakhoi district were engaged at the seat of war.

Trade route
from Pakhoi
to Yunnanfu.

9. Pakhoi is not a large town nor an old one. The population to-day is about 20,000, and it dates back only to 1852, when some Cantonese merchants settled there. It seems to have thriven fairly well, for it was one of the treaty ports agreed to be opened to foreign trade in 1860, though the actual opening did not take place for some years later. Its principal and most direct connection with Yunnan is to be seen on the map appended. The route is long and difficult, partly by land and partly by water.

From Pakhoi to Nanningfu the journey has to be accomplished overland, from Nanningfu to Posé by the West River, and from Posé to Yunnanfu again overland. Cotton goods are the principal staple article taken from the Port of Pakhoi to Yunnanfu, and there they are exchanged for tin and opium which are brought to the coast.

During the Mahommedan rebellion trade was much disturbed, and under the peculiar conditions it is less likely that plague was imported from Yunnan, by the ordinary limited intercourse of traders, into the Pakhoi district and the island of Hainan, than by the movement of Chinese troops, many of which, as previously stated, were drawn from the island of Hainan and from the western prefectures of Kwangsi and Kwantung close to Yunnan. No doubt there would be many traders with the troops for the purpose of supply. This latter view of the manner in which plague spread from Yunnan to Pakhoi appears to be held by the Chinese, and it is more in accordance with that which is known concerning the rapid spread of epidemics from one distant locality to another, namely, that these epidemics of a sudden and rapid growth are usually associated with large movements of population. An epidemic of plague occurs in Yunnanfu in 1866 which decimates the population while they are in the midst of war, and in 1867 Pakhoi is attacked, one of the homes of returning troops from Yunnan.

The distance between Yunnanfu and Pakhoi is about 3,000 lis and it takes about forty-eight day stages to travel from one to another. What intervening localities were attacked is unknown, but it is unlikely they escaped.

Plague
endemic in
Pakhoi from
1867 to 1884.

Once the disease was established in Pakhoi it seems to have become endemic for eighteen years. There was a severe epidemic in 1877. Every year it recrudesced and prevailed more or less from March to June until 1884, when from the reports of the Medical Officer of the Customs it seems to have ceased until re-infected in 1894. This spontaneous cessation of the plague is a phenomenon which has not infrequently manifested itself in small towns, occasionally in large cities, and rarely in commercial towns, such as Smyrna and other busy entrepôts of trade in close communication with infected centres.

Plague not
extinct in
adjoining
prefecture to
that of
Pakhoi.

10. Although Pakhoi seems to have enjoyed a freedom from plague for ten years, from 1884 to 1894, the disease was far from being extinct; it not only continued to prevail in the Province of Yunnan and at varying intervals

in the neighbouring towns of the Kweichow, Kwangsi, and Kwantung Provinces, but it was also present in the adjoining prefectures to that in which Pakhoi is situated. They are localities away from European contact, and it is only incidentally that plague is discovered to prevail in them. Distant from the coast ports, from the customs stations, or from missionary outposts, news becomes exceedingly scanty, infrequent, and unreliable, and occurrences, however important or disastrous they may be to the localities affected, but rarely come to the ears of Europeans. It is certain that from 1890 a gradually extending area of the western parts of Kwangsi and Kwantung was becoming affected with plague, but it is only in fragments of news that this fact is gathered.

In Dr. Sharpe's report on the health of Pakhoi for 1890* plague is thus referred to as occurring in some of the Kwangsi towns: "By a letter lately received from Lungchow we learn that bubonic plague (yang-tzu-cheng) or as it is known at Pakhoi, li-tzu-cheng, made its appearance there during the latter part of March this year. Having originated in Yunnan, it passed through the town of Posé and the prefectural cities of Nanning and Taiping in Kwangsi, and thence to Lungchow, also in Kwangsi. Considering that a certain amount of merchandise passes regularly between Nanning and Pakhoi it might be supposed the plague might find its way here, but up to the date of this report no cases have occurred since the spring of 1884."

Plague at Lungchow, Posé, Nanning and Taiping in 1890.

The epidemic at Lungchow disappeared in April, 1890, after a heavy fall of rain. The next outbreak at Lungchow is heard of in 1893. As soldiers were the first victims of the outbreak, Dr. Simmonds, who was at Lungchow at the time, was of opinion that the disease was imported into the garrison of Lungchow from Liencheng, a frontier town on the borders of Yunnan. There was another epidemic in Lungchow in 1894, which was evidently a recrudescence of the outbreak of the previous year.

11. Notwithstanding that the plague did not reach Pakhoi from Lungchow, Taiping, or Nanning, we find that in 1891 Kaochoao, which is on one of the main trade routes from Taiping to Canton, and nearly 200 miles east of Pakhoi and nearer Canton, is affected by an epidemic of plague. Nor was the prefecture in which Pakhoi is situated free from plague even when Pakhoi enjoyed an immunity, for it is recorded that plague prevailed in March and April of 1892 in a district near Ampu.† Thus:

Plague at Kaochoao in 1891.

"The native population in the immediate neighbourhood has not been visited by plague or any epidemic since influenza was prevalent during February of last year; but in a district near Ampu, about 100 miles to the east of this port, bubonic plague carried off a large number of people during March and April. I am informed by one of the French missionaries who has resided for many years in the neighbourhood of Ampu that bubonic plague is endemic in a small district near that place, and that isolated cases will be found there at any time of the year, but that during the early spring of some years the disease

Plague at Ampu in 1892.

* *Imperial Maritime Customs Medical Reports* for the year ended 31st March, 1890, 38th and 39th issues, 1894.

† *Imperial Maritime Customs Medical Reports* for the year ended 30th September, 1893, 45th and 46th issues, 1895.

occurs as an epidemic, and then the only chance of escape is to leave the district until heavy rain has fallen."

Plague in
Mouiluk in
1890 and 1893.

12. Still further east than Pakhoi or Ampu is Mouiluk, which is south of Kaochoa and near the French possession of Kwan-shan-wan. From a medical missionary I learn that a severe sickness which is believed to have been plague prevailed at Mouiluk in 1890, and from Dr. Swan of Canton that early in 1893 a severe epidemic which was ascertained to be plague, and which destroyed several hundreds of the inhabitants, attacked the locality. Mouiluk is about 300 miles south-west of Canton. It is evident that in the three years from 1890 to 1893 plague was every now and then reported as prevailing in different places in the south-western portions of the two provinces of Kwangsi and Kwantung.

Plague at
Mengtze,
1874-1893.

13. If we now go back to the Yunnan Provinces we shall find that as soon as the Customs opened a station at Mengtze, one of the principal towns in the south-east of the province, plague is immediately reported as epidemic there. It is the usual history of plague in China. Nothing is heard of it in a particular locality until that locality is visited by a European. The disease prevailed in Mengtze for many years prior to the advent of the Customs officers, but it was not discovered and described by a European medical man until 1894. By the time Dr. Michoud's* report on plague in Mengtze was issued the disease had appeared in an epidemic form in Canton, Hongkong, and Macao.

Mengtze is situated in the south-eastern part of Yunnan, in latitude $23^{\circ} 34' N.$, and longitude $103^{\circ} 36' E.$ Like most of the principal towns of Yunnan, it is in the middle of a large plateau elevated 4,500 feet above sea-level and surrounded by mountains rising from 6,000 to 9,000 feet above the sea-level. The town is the centre of a large traffic between Yunnan and the Province of Kwangsi, as well as between Yunnan and Tonking.

The Imperial Chinese Customs opened a station at Mengtze in 1899, and the European officers on their arrival found plague prevailing. It had recurred every year in Mengtze since 1885, and first appeared there in 1874. There was a severe epidemic in 1892, but according to native reports, the epidemic of 1893, which continued during the months of June, July, and August, was, compared with previous epidemics, not particularly severe. Dr. Michoud, in describing the epidemic, remarks that "however, out of an estimated population of 10,000 or 12,000, a thousand people died. Carried outside the dwellings, the victims of plague lay dead or dying unheeded in the streets, or set in rows leaning against the city wall. We saw, on some roads, dogs and pigs feeding undisturbed on corpses which no one cared to bury. These animals fell victims to their voracity and succumbed to the scourge." Dr. Michoud continues: "In some places whole families disappear. At the beginning of the last epidemic, we were called to the young son of the Chen-tai (Chinese general) of Mengtze. The poor boy had just been given over by the native doctors, who, probably from fear of displeasing the father, would not declare the nature of the disease. As

* Dr. Michoud's Report on the health of Mengtze for the year ended 30th April, 1894. *Imperial Maritime Customs Medical Reports* for the year ended 30th September, 1894, 47th and 48th issues, 1895.

we were aware of a case of yang-tzu-ping having already occurred in the Cheng-tai's yamen—considering, too, the rapid evolution and extreme gravity of every symptom exhibited by the little patient—disregarding, at the same time, the hypothesis of heat-stroke or pernicious intermittent fever, we had no hesitation in spite of the absence of any external adenitis (and to the great displeasure of the father) in diagnosing yang-tzu-ping. Although ready to do our best we insisted on the probable failure of any treatment, and urged the necessity for immediate and energetic disinfection in order to ward off further diffusion of the disease. The boy died shortly afterwards. None of the measures advised were taken, because the native quacks denied the accuracy of the diagnosis. Doubtless the failure of our treatment had discounted the value of our advice. However that may be, the Chen-tai, an old warrior who had spent his whole life in Yunnan, and had passed unscathed through the previous epidemics which decimated the country, was, in a few days after the death of his son, attacked by yang-tzu-ping and speedily perished. Some of his wives, many of his relations and servants, were in succession attacked, all the cases ending fatally. The people that died from yang-tzu-ping in that yamen before the end of that epidemic numbered at least 25."

14. The epidemic described at Mengtze, following as it did a severe epidemic in 1892, occurred in May, June, and July of 1893. Two months later the disease is stated to be epidemic in Lungchow and in many towns of the Kwangsi Province, such as Nanningfu and Kwaiun, the latter of which is not more than 200 miles from Wuchowfu.

Plague at
Nanningfu
and Kwangsi
in 1893.

15. In connection with the prevalence of plague in Yunnan and its spread to Southern China, the following remarks of M. E. Rocher are interesting: "As it was to be feared that either the Canton River by Paise, or the Red River by Manghao and Laokay, would become infected by the disease, I reported the matter to the (French) Colonial authorities. I do not know what steps were taken, but in 1892 the inhabitants of Manghao, on the banks of the Red River, reported that plague had made its appearance, and soon afterwards the same news came from Paise, from which place it descended to Pakhoi and Canton." (Appendix E.)

Plague at
Manghao and
Paise in 1892.

16. It is clear that plague was extensively diffused at this time. It was epidemic in Mengtze in 1893, and for several years previously. It was also epidemic in some of the south-western towns of Kwangsi, especially those situated on the West or Canton River, and it was more or less prevalent in the south-western districts of Kwantung.

Plague at
Canton in
1894.

The existence of plague in these places excited no interest beyond the localities affected, and it was not until the disease reached the Delta of the West River and attacked Canton, the capital of Kwantung, and an epidemic of exceptional proportions began to devastate the city in the spring of 1894, that the fact that plague in a dangerous form existed in China became generally known to the Europeans living in that country.

(b.) AFTER THE OUTBREAK IN CANTON IN 1894.

Canton connected with the chief towns and districts of Kwangsi and Kwantung.

1. Canton is the chief port, as well as the largest and most important city in Southern China. It is the capital of the Kwantung province, and contains a population variously estimated at $1\frac{1}{2}$ to 2 millions. Situated in 23° of latitude N., and $113^{\circ} 14'$ longitude on the banks of the Pearl River, it is some 70 miles from the coast, and in the centre of a district traversed and intersected with waterways, formed by the convergence of several rivers from the north, east, and west. By this network of waterways, Canton is connected with the chief towns and districts in Kwangsi and Kwantung. At the mouth of the Pearl River lies Macao on one side, and the Colony of Hongkong on the other.

The inland water communications of Canton extend westward to the borders of Yunnan and Kweichow. The Sikiang, or West River, or Canton River as it is sometimes called, is navigable for small steamers as far as Wuchufu. From there to Nanningfu the passage is more difficult on account of some dangerous rapids, but native boats make it successfully, and ply between the two towns. From Nanningfu to Posé the river is suitable for light-draught boats, which are busily engaged in carrying produce to and fro. Posé is on the borders of Yunnan, and the produce reaching it by boat is taken by pack animals overland to Mengtze.

West of Nanningfu a branch of the river leads to Taipingfu and Lungchow. It will be seen from the map that Mengtze and Lungchow, both infected centres of plague, are on lines of direct communication with Canton. The West River is the natural and most convenient trade route for produce and traffic from Yunnan, Lungchow, and the greater portion of the Kwangsi province, but, as previously stated, notwithstanding the advantages of this route, it used not to be favoured by Chinese merchants, who preferred to take their merchandise from Nanningfu overland to Pakhoi, rather than direct to Canton. The reason of this was partly because it was a shorter route to the coast but mainly because of the numerous likin charges between Nanningfu and Canton, there being no fewer than sixteen likin stations. This was altered in 1891, and the system of transit passes introduced, which resulted in a greater use of the West River for the conveyance of produce and passengers both to and from Canton.

Whether plague reached Canton from the infected towns and villages of the south-western part of Kwantung or direct from Yunnan and Kwangsi by the West River is immaterial. Probably the infection arrived by both channels, but, whichever was the first, the original source was Yunnan. Fatshan, a town situated on the delta of the West River and a few miles from Canton, is said by some Chinese gentlemen to have been infected in 1893. It is the custom of the Chinese to send their dead to be buried in their native village or town, and the infection at Fatshan is attributed by them to bodies of persons who died of plague at Mengtze having been sent to Fatshan for burial in badly fitting coffins. The first cases in Fatshan occurred in families who were connected with Mengtze. It has already been noted that both at Mengtze and Lungchow, plague occurred among the military stationed at each

place, and it is a curious fact that the first case in Canton seen by a European physician was in the family of a soldier.

2. The first recorded case of plague in Canton* occurred on January 16th, 1894, when Dr. Mary Niles was called in to see General Wong's daughter-in-law, who was reported to be suffering from a "boil," and who, when seen, was found to have a very painful swelling in the inguinal region, a temperature of 104·8 with a pulse of 150, and a petechial eruption. The patient recovered, but the bubo, owing to sinuses forming, took a very long time to heal. Out of seven cases seen by Dr. Mary Niles up to May 2nd, in no fewer than four purpuric spots appeared before death. In a number of cases met with the illness was of a light character, for instance, Dr. Niles records a case in which "a lady came in a chair but walked into the office. She looked perfectly well, temperature, pulse, and digestion normal. She said she had fever six days before, and the following day when taking a bath discovered a swelling in the inguinal region, of which she had not previously been aware, and which caused her no pain. I examined the bubo and saw for myself." This case is suggestive of other similarly mild cases and the likelihood of these occurring at an early stage of the outbreak without attracting any special attention. Dr. Niles further states, "It has been noticeable to the people that rats in infected houses have died. In the house where the child from the school was visiting when she took the disease thirteen dead rats were swept out one morning. . . . One of the officials, I am told, offered 10 cash for every dead rat brought to him. He had collected 35,000 in one month; 2,000 were brought to him in one day."

Plague in
Canton in
January,
1894.

It was only towards the end of March that the disease began to attract attention. Dr. Alexander Rennie reports that † "a few stray cases occurred in the beginning of March, but it was not until the end of the month that attention was awakened on account of its fatal prevalence in a poor neighbourhood near the south gate of the city, and also in Nan-sheng-li, a quarter occupied by Mahomedans, among whom the mortality was very high. At this time the type of the disease was exceedingly severe—of those attacked quite 80 per cent. dying. Towards the middle of April the cases we saw were of a milder type, but the disease subsequently became more severe, and extended its boundaries to other parts of the city and also to Honam, the maximum mortality being reached about the middle of May. . . . Rain fell copiously during the month of May and beginning of June, so that many streets were under water; the temperature remained comparatively low. But both these factors seemed to favour the propagation of the disease, as by the beginning of June it was rife in the western suburbs as well as in the surrounding towns and villages. It is impossible to give any correct estimate of the mortality, as no official records of burials are kept. Comparing the estimates obtained from various sources, we believe the mortality from the beginning of the epidemic to the middle of June (the date of writing) to have been about 40,000. . . .

* Plague in Canton by Mary Niles, M.D. *The China Medical Missionary Journal*, June, 1894, page 116.

† Report on the plague prevailing in Canton during the spring and summer of 1894. By Alexander Rennie, M.A., M.B., C.M. *Imperial Customs Maritime Report* for the year ended 30th September, 1894, 47th and 48th issues, 1895.

"Although a goodly number of well-to-do people fell victims to the pestilence, the chief sufferers were the poor—over-crowded and badly housed. The people who escaped the scourge in the most marked degree were those living in upper stories and the boating population. With the exception of those put in boats after falling sick, scarcely a case was noted on the river. Many well-to-do people, observing this immunity, removed from their houses and made their homes on the water. Judging from this circumstance, therefore, and also from the fact that rats living in the ground and drains were the first animals to fall victims, we infer that the specific poison emanated from the soil. What the specific poison may be is not determined, but no doubt the insanitary conditions referred to, exaggerated by a prolonged drought, provided a specially suitable nidus for its growth and dissemination.

"The immunity enjoyed by residents on the foreign settlement of Shamien is remarkable, seeing that it is separated only by a creek some 20 yards wide from houses where cases of plague occurred. Not only did foreigners living on the settlement enjoy excellent health, but no case of plague occurred among their servants living on the premises. The rats also, up to the time of writing, remain healthy and lively."

Dr. Rennie further states in this report that on the outbreak of the disease occurring in Canton many persons, especially the well-to-do, removed to the country, thus forming fresh foci for its dissemination; and in the same way the outbreak in Hongkong no doubt arose from persons having migrated from Canton to Hongkong while actually suffering from the disease, or during the short incubation period.

Dr. Mary Niles also states that "patients went home to the country in passage boats, some died in the boats, and others in their native towns." Under such circumstances and from such a centre as Canton, which communicates with so many places, the infection was bound to be disseminated.

Hongkong
the largest
and most
important
European
possession
near Canton.

3. The largest and most important European possession near Canton is Hongkong, situated at a distance of only some 80 miles, with daily river communication with Canton both by steamers and junks. Hongkong, on account of its position at the mouth of the Pearl River, its population being mainly Cantonese, and the great and increasing traffic with Canton, has been suggestively called the suburb of Canton. The extent of intercourse between the two ports may be gathered from the fact that nearly half-a-million of people pass each way to and fro annually, and some 4,000 river steamers and 8,000 junks annually enter the port of Hongkong from the Canton and West River district, most of them coming from Canton and its neighbourhood.

Plague discovered in
Hongkong
in May, 1894.

4. Under such conditions it is not surprising that whatever affects Canton is not long in making itself felt at Hongkong. This year when cholera broke out in Canton there was only an interval of a few weeks before the disease appeared in Hongkong. And so it was with plague in 1894. As soon as the disease was well established in epidemic form in Canton, it was discovered to be present in Hongkong.

Although there is no positive evidence of the first cases of plague coming from Canton, rather than from the other affected areas in its vicinity or from

Pakhoi, yet as large numbers of the inhabitants in order to escape plague were fleeing from Canton to Hongkong, the probabilities are greatly in its favour, particularly so when the enormous ordinary traffic is taken into account, together with the circumstance that detection of sick persons entering the Colony is impossible, because there is no system of inquiry as to sickness, nor is there any inspection of passengers on steamers and junks from Canton or from the West River.

Dr. Lowson in his able report on the epidemic of bubonic plague in Hongkong in 1894,* is of opinion that the disease was imported from Canton rather than from Pakhoi, where it did not prevail until the latter part of the spring, and between which and Hongkong the traffic is insignificant compared with that between Hongkong and Canton. Once introduced into Hongkong, the disease caused the greatest alarm, but the epidemic, though severe, is not to be compared in intensity with that in Canton, even if the lowest estimate of 40,000 be accepted as the highest number of deaths. Many in Canton have estimated the deaths from plague in that city in 1894 to have been between 80,000 and 100,000. The deaths in Hongkong did not exceed 3,000.

In neither city do the figures given represent the total number of cases of plague or extent of mortality, for at the height of each epidemic the Chinese fled from both Canton and Hongkong to their homes, many of them dying on the way or sickening with plague on their arrival.

5. It was in the Hongkong epidemic of 1894 that the causal agent of plague, the plague bacillus, was discovered by Dr. S. Kitasato of Tokyo, on June 14th. Later Dr. Yersin made independently a like discovery in Hongkong. The Hongkong epidemic began in May and ended in August, and its incidence was proportionately more severe on the female portion of the population than on the male. Macao did not suffer epidemically from the disease until April, May, and June of 1895. During the winter of 1894 and 1895 there prevailed a fatal epidemic which attacked the respiratory organs, and which was believed to be influenza. It is worth noting that this was at a time before the pneumonic type of plague was recognised as a variety of the disease. The first case of bubonic plague which came under the notice of the Portuguese authorities was an imported case from Hongkong, and to this source is ascribed the origin of the epidemic; but as the case came under the care of the sanitary authorities the next day after arrival, also as there was a high mortality among the Chinese with no means of ascertaining the exact cause of death, and as the epidemic quickly followed the introduction of this single case, which is an unusual occurrence with plague, whose progress at the beginning is generally slow, it is likely that Macao was infected earlier. The epidemic reached its acme in April and May and disappeared in June, and returned in 1897 and 1898. From the position of Macao and its intercourse with Canton, Pakhoi, Hongkong, and the villages of the delta, it could only be a matter of time for it to be infected by people from one or all of these places.

The plague bacillus discovered in Hongkong by Dr. S. Kitasato and later by Dr. Yersin.

Plague in Macao in April, 1895.

* The Epidemic of Bubonic Plague in Hongkong, 1894. *Medical Report* by James A. Lowson, M.B., Medical Officer in Charge of Epidemic Hospital, Hongkong, 1895.

Plague in Southern China mainly in the towns and villages near the sea-coast and on the principal rivers.

6. With Canton, Hongkong, Macao, and Pakhoi infected with plague, it was not long before the disease became extensively diffused. The disease in Southern China appears, however, to have mainly kept to the towns and villages situated near the coast and on the principal rivers. It has not spread northwards into the Provinces of Honan and Kiangsi. The Provinces of Kwangsi, Kwantung, and Fukien which are infected, are separated from those on the north of them by a range of mountains which, commencing in Thibet, passes through Yunnan and Kweichow, and, under various names, extends eastwards to Chekkiang on the sea-coast. This range forms a natural boundary limiting the commerce between the north and south. From the range spurs come down southwards with valleys between, and in these are streams and rivers joining the North, South, and West Rivers already mentioned, which form the natural channels of communication between different parts of the provinces. Inland the great highways are the rivers and streams, while on the coast communication from place to place is principally by sea. The infection, so far as can be ascertained, has mainly affected first the towns on the rivers and coast, gradually spread from them to the adjacent villages, and then from village to village.

Except in the towns and villages where missionaries reside and visit, or in those immediately adjacent to the treaty ports and near the customs stations, it is next to impossible to obtain any reliable information concerning the prevalence of disease in China. Even in those mentioned as exceptions, it is not easy, because the Chinese think it unlucky to refer to misfortunes. They are reticent among themselves on the prevalence of plague, and are generally reluctant to speak about it freely with foreigners.

Plague in Swatow and its neighbourhood.

7. The events occurring in the neighbourhood of Swatow may, however, be taken as an index of what is occurring elsewhere in the infected provinces of Kwangsi, Kwantung, and Fukien. I visited Swatow and some of the villages near it, and had the advantage of being accompanied by Dr. Layng or Dr. Lyall, both of whom are familiar with the town and district, in which they have practised many years. Both take a great interest in the spread of plague, and have kindly prepared for me a map of the infected districts. Dr. Lyall is the oldest practitioner in Swatow, having been there some twenty-three years. His connection with the mission brings him much in contact with the Chinese, while the branches of the mission give him opportunities of hearing of infected villages which do not readily come to others. But even with such exceptional opportunities of acquiring information, the extent of plague is seldom ascertained even when the disease is known to prevail.

From the map, which gives the year in which the towns or villages were first infected, and in some cases the direction in which the plague spreads, it will be seen how slowly but surely the disease is infecting village after village and town after town. I quote Dr. Lyall's explanation:

"If you will look carefully over the map, you will notice that there seem to be two ways by which the plague spreads. One is by radiating from centres into neighbouring villages, and the other is by making a 'jump' as it were over considerable distances to some town beyond, without infecting intermediate places. Then the new places

form a centre of infection by radiation and 'jumping.' Thus to the north you will find Ung Kug infected, and none of the villages between it and Swatow being yet infected. From Ung Kug it has spread to Chia-na, but has not gone inland yet. To the west, Mai-On, a town 60 miles from Swatow up the river, was the first place infected, and it was infected not from Swatow, but from Hwei-lai, between which towns there is a large carrying trade of salted fish. One of the coolies engaged in the portage contracted the disease and died at Mai On. From Mai On it spread to Li On, near Swatow. There is a series of villages, Tsan-phon about 8 miles from Kuh Yang. In this series of villages in the same year one was infected from Chhiah-lian (between which villages there is a large trade in salted vegetables, and as in Mai On one of the coolies contracted the disease in Chhiah-lian) and one from Swatow. You will also notice that this year the plague has 'jumped' from Kuh Yang to Thung Khe, a distance of at least 12 miles, and it has already during this one year infected two or three neighbouring villages, to the south and west. There seems to be no plague from Cup-chi westwards. Kong-pheng in the west was infected from Hongkong—a man came from Hongkong, developed plague, and died. Next year it appeared in epidemic form. The Chinese say Kong-pheng is a dirty town, so it must be dirty. From Kong-pheng, the other places in that region have been infected. The only village in the estuary so far infected is Chhi-tshan. This village is the trade terminus for Tua-na. Boats carry goods to Chhi-tshan, and the goods are then carried by road to Tua-na. It has been infected secondary to Tua-na. With regard to question 15—what I mean is this, in a good many places where plague has broken out in a Chinese house I personally know that dead rats have been found behind furniture, &c. And it does seem that from one place to another, one way at least of carrying the plague is by infected individuals. At the same time I must say that in scores of cases when infected persons have been carried to their homes and died, no epidemic has resulted. *Re Thung Khe.*—I sent to a pupil for particulars. The plague is rife in two villages about 2 miles distant, and rats and mice are dying in Thung Khe itself, but no person has been infected yet. Perhaps I should explain that in this part of China villages are often arranged in groups under a common name, and that each village has its own special name in addition, thus 'Thung Khe' is not only the name of the village, but of a group of villages lying around it. The condition of affairs is this: Two of the outlying villages are infected with plague, but that in Thung Khe itself rats only are dying.

"I hear from another pupil about a group of villages called Tek Kee, 5 miles from Kieh Yang. This year a native of one of the villages contracted the disease at Chao Chow-foo, was taken home, and died. Since then a few more cases of the disease have occurred. It will be interesting to see if it becomes epidemic in Tek Kee next year. Though only 5 miles from Kieh-yang, where the disease had been very bad for a few years, it has escaped; and now it has been infected from

Chao Chow-foo, at least 30 miles distant. It is only in the villages one can hope to trace the origin of the infection. Towns and cities are absolutely hopeless."

Swatow is in the province of Kwantung at the mouth of the river Han, and is in longitude 116 E and latitude 23 N. It is a mercantile town, with a population of 30,000 to 35,000 inhabitants, the greater proportion of which are males whose wives and families reside in the surrounding villages. There are a number of emigrant houses for the lodgment of emigrant coolies drawn from the surrounding district and on their way to Amoy, Hongkong, Singapore, Bangkok, Saigon, and Deli. The port generally compares favourably with other Chinese towns as regards cleanliness. The two main thoroughfares have drains, the trap doors of which are lowered at high water, and kept closed at night in order that the drains may act as a reservoir in case of fire. No excreta pass into the drain. There are no sanitary laws or regulations. The inhabitants of the two main thoroughfares employ their own scavengers, and the Tai Hong Hong Society employs thirty scavengers and makes itself responsible for the early burial of the dead. The other portions of the town are very filthy. The houses are one-storied, badly lit, and badly ventilated; swine, fowls, children, and adults enjoy the same privileges in common as regards accommodation both inside and outside the house, and the smell of the latrines, which are open cesspools or reservoirs, and are to be met with at nearly every corner, is such as to make a European shudder; and yet it is said to be one of the cleanest towns in that part of China. It is amidst these conditions that the Chinese live, and they are similar to those under which plague prevailed in Europe in the 14th century.

The first cases of plague which appeared in Swatow and in Chaoyang in 1894 were imported from Hongkong. Chaoyang is a residential town of nearly 100,000 inhabitants, is a few miles distant from Swatow, and contains many shopkeepers and traders connected with Canton and Hongkong. Dr. Layng had in hospital a trader from Chaoyang in 1895 who fled from Hongkong with two friends in 1894. The three suffered from plague on their arrival at Chaoyang, and only this one recovered. Inspection of steamers on arrival at Swatow from Hongkong was commenced on June 5th, and ended July 31st, 1894, the few isolated cases which gained admission not being sufficient to cause an epidemic in that year. The rats, however, began to die in the characteristic manner in several hongs, and a few cases of plague occurred among the inhabitants. One of these Dr. Cousland saw towards the end of August, 1894. He was a clerk in the telegraph office.

In the spring of 1895 the disease appeared in epidemic form in Swatow and Chaoyang. The Chinese called it the Hongkong sickness, just as in Pakhoi, and in Canton they called it the Yunnan sickness. Since 1895 it has appeared in epidemic form either in Swatow or district.

In 1896 it was epidemic in Chaoyang and district of Hainan; in 1897 in Tathoupou and villages due south-east; also Haitai on the south-west.

In 1898 the port of Swatow, Chaoyang, and Haitai.

In 1899 Ampou and villages, north and south-east, Nugking north, and Haitai and Kensu to the south-east.

In 1900 Chaoyang, part of the city of Chowchowfoo, and Nugking to the north.

In 1901 Ampou and surrounding villages Kityang, Poseng, and Tathoupou. It also prevailed in Nugking and in the port of Swatow.

8. The description of one village applies to most others. Sua-bui is about an hour and a half's sail from Swatow. The houses are clustered together with a few lanes of some 6 to 8 feet in width and some passages not more than 4 feet intersecting the village.

Plague in the village of Sua-bui

Fronting the lanes are shops and houses and entrances into courtyards. The shops are narrow, obtaining their light only from the front. The houses in many instances are entered direct from the street and consist of one or more rooms, and are usually devoid of other means of light than the door; sometimes there is a small window of 1 foot in length by 9 inches in breadth. Other entrances give access to a small courtyard, around which are windowless buildings entered by separate doors. In fine weather the inhabitants, when not out in the fields, spend most of their time in the courtyard or in the street. At the time of the visit garbage was to be seen heaped up almost everywhere, being thrown out of the house and left to the disintegrating forces of nature and of the pigs and fowls. Pigs moved or lay about the lanes, or were in the courtyard or in one of the rooms of the house with the fowls. Calves and cows were usually tied in some corner of the lane or were in the courtyard. The drains were full of foul, putrefying black mud or stinking water which could get no outlet, being blocked with garbage. Streets, passages, and courtyards were a mass of uncleanness. The latrines, however, were well-built reservoirs, the fæces and urine being valuable, but the smell from them was extremely offensive. Several of the windowless houses were closed because their inmates had fled from them, either to other villages or to the hills, to escape from the plague, which had been in the house.

Among this congery of badly-lighted, badly-ventilated, and filthy houses there were a few to be seen better built, better lighted, and cleaner. They were the exceptions, and they had escaped plague. Outside the village are the fishponds, which also have latrines over them. The ponds, when emptied, supply in the mud taken from them a valuable manure.

Just before leaving Hongkong I received a letter from Dr. Layng mentioning that this village had been very heavily struck with plague, and had lost nearly half of its inhabitants.

9. Although it seldom attracts outside notice, the mortality in some of the villages and towns is very great. In a town of some 15,000 inhabitants, not far south of Chaoyang, it is estimated that over 3,000 died. In Ampou, a cluster of villages about 10 miles from Swatow, and a centre for rice, fruit, and vegetables to be brought down to Swatow, the mortality was so great in 1901 that the inhabitants of whole villages fled *en masse*, and got boats and lived in them on the river, while others deserted their villages and put up small mat sheds along the coast. Nearly all the large villages between Hongkong and Swatow are affected.

The mortality from plague in some of the villages and towns very great.

Dr. A. K. Scott reports that "the City of Ung Kong (an intolerably filthy city) lost a tenth of its population, if one may trust Chinese statistics."

The same tale is told of most of the villages and small towns which have become infected with plague. Large towns seem to fare very much like a cluster of villages or towns, one portion being badly affected one year and another portion another year.

One of the characteristics of plague seems to be an alternating severe and mild epidemic. In one year the town or village is attacked badly, while in the next year it is only slightly affected. In Chaochowfoo, for instance, a town of some 200,000 inhabitants, the first outbreak was in 1898 and was bad, the second was in 1899 and was light, the third in 1900 bad, and the fourth in 1901 light. This may possibly be explained by the rat mortality in the severe epidemics considerably reducing the number of rats to be attacked next year.

Agents by which plague spreads.

10. The agents by which the plague spreads from village to village and town to town, as shown in the reports, are sick persons or infected clothing, or sick rats brought in boats; from house to house, rats or infected persons; and from person to person in the same house, direct infection, infected food, and infected vermin.

Summary of medical opinion.

11. The following is a summary of the opinions formed by personal observation of the main cause or causes of the spread of plague:—

*Name and Reference in Appendix F.	Opinion.
1. Dr. LYALL, Swatow. Page 18.	1. From house to house by rats, from one place to another by infected individuals.
2. Dr. H. LAYNG, Swatow. Page 17.	2. The introduction of plague-stricken people into badly ventilated, sunless, and filthy houses crowded with human beings and often with a few pigs in addition.
3. Dr. A. K. Scott, Swatow. Page 19.	3. Rats, and infection, and inoculation from persons suffering with the disease. Nurses sleeping in the same room almost always contract it.
4. Dr. P. B. COUSLAND, Chow-chowfoo. Page 20.	4. From place to place by infected individuals, and from house to house by rats. The spread of the plague past this hospital was clearly traced. First came the death of rats in the shops, day by day, nearer and nearer, followed a few days later by cases of plague among the shopmen; so the stream of rats, and then human fatalities flowed past the hospital. The street is on the top of an embankment and has no side branches, so the progress was not complicated. There were no rats in the hospital and no cases.
5. Dr. J. M. HOWIE, Changpoo. Page 22.	5. Proximity, <i>i.e.</i> , close touch with rats, fleas, and filth. Main cause inoculation, <i>e.g.</i> , flea, bug, louse, or mosquito bite; even rat bite or pig bite if these animals are infected.
6. Dr. J. P. MAXWELL, Changpoo. Page 23.	6. It is extremely hard for me to answer these last few queries in a truly scientific way. There is no doubt that at these times there have been epidemics among pigs, buffaloes, fowls, and dogs. As to pigs, what the Chinese call "pig plague" is probably swine fever, and is certainly not usually bubonic plague. It is accompanied by lesions of the intestine and fever. But at the same time there have been several serious epidemics of a disease among the pigs of certain villages in which they have died, and I have seen the whole of the

*Appendix F printed and bound in a separate volume with Appendices A., B., C., D., G., H., K.

Name and Reference in Appendix F.	Opinion.
	<p>lumbar glands enlarged and inflamed clinically like those found in bodies dead of plague. But taking the vast number of pigs in these regions, the percentage must be very slight. I have been unable to carry out any bacteriological examination, so cannot be positive on the identical nature of the disease. As to buffaloes, I am still more in the dark. I know of two places where there were epidemics among these last year. In the one case I strongly suspect rinderpest. In the other I am assured that the glands were enlarged, but I did not see the carcasses myself. Dogs occasionally died with glandular swellings during the plague epidemic, but I did not see more than four myself. Fowls are said to have died, and I saw one in which all the glands were enlarged and inflamed. But neither dogs nor fowls are particularly susceptible, as I have seen them with impunity eat sputum from pneumonic cases. As to the main causes of the spread of the disease, the Chinese are clear on its association with rat mortality, and I am equally clear from my own observations. But as to its immediate cause, I am getting more and more doubtful about the rat-flea theory. I cannot see how we can escape plague. I must have been bitten, in spite of flea-powder, many times by fleas off plague patients, and so must my students. The Chinese, especially the women, catch their fleas and kill them with their teeth. If they catch fleas with plague bacilli in them how do they escape? The other day a girl in a village near here brought home a bundle of clothes from a plague village. In a week or so, most virulent plague broke out in the house and nine people died in that house alone. I am, at present, making more inquiries into this attack, and if you would like them I will send them later on. Rats undoubtedly carry the plague on in some places. I have not a doubt that the set of O'chie villages was affected in this way.</p>
<p>7. Dr. A. FAHIMY, Chiang-chiu, Fuk-kien. Page 24.</p>	<p>7. Rats are probably the chief agency in the spread of plague.</p>
<p>8. Dr. H. L. PATON, Chin-chiew, Fuk-kien. Page 25.</p>	<p>8. The rat has a good deal to do with it, perhaps by contaminating the food, if not by actual contact.</p>
<p>9. Miss L. M. MASTERS, Ngu Cheng Hok Chiang Fuk-kien. Page 26.</p>	<p>9.—A. <i>Spreading from town to town.</i></p> <ol style="list-style-type: none"> (1.) Travellers sleeping in bedding rented from the pawnshops which comes from infected houses. (2.) Eating sweet potatoes in which rats had died. (3.) Frightened natives leaving their infected homes and villages to seek a place free from the plague. <p>B. <i>Locally.</i></p> <ol style="list-style-type: none"> (1.) Overcrowded, poorly ventilated houses. (2.) Remaining too long in the sun on the hill and not careful to wash their hands and face frequently when waiting on the sick. <p>The plague was preceded by a rat mortality.</p>
<p>10. Dr. ELLEN M. LYON, Foochow, Fuk-kien. Page 27.</p>	<p>10. Filth, bad drainage.</p>

Name and Reference in Appendix F.	Opinion.
11. Dr. H. T. WHITNEY, Pagoda Anchorage, Foochow, Fuk-kien. Page 28.	11. Rats and transferring of plague patients. Mosquitoes and fleas have been suspected, but have no proof.
12. Dr. J. L. MAXWELL, Tainan, Formosa. Page 32.	12. Certainly the spread appears connected with the death of rats. I have many times heard that "the rats are dying in such and such a house," and then been very shortly summoned to cases of plague in the same house.
13. Dr. A. N. WILKINSON, Daitotei, Formosa. Page 33.	13. It is spread by personal contact with cases, relatives going from one village to another; but one must also believe in the earth theory from Kitasato's experiment, and also rats carrying it from one place to another.
14. Miss F. P. CROWTHER, M.B.C.M. Eng Chuen, Fuk-kien. Page 34.	14. Rats, certainly, but how? This year the plague commenced in my house (under the following circumstances), and from it was infected a great part of the town of Eng Chuen. In the adjoining house was a room that had been left unopened since the preceding June, where I attended 15 persons, who died therein. On March 20th, this room was opened by a slave; on the 22nd, my rooms in a native house, which were generally swarming with rats and mice, now were absolutely free from them; food placed on the floor was left untouched, 15 rats were found dead in the stables and adjoining rooms. I noticed that my dog, a collie, ate them with no ill effects. On the 23rd, a slave girl in my house was taken ill with high fever, and on that day died. The day before death a bubo in groin appeared. Meantime the slave girl who had opened the room was stricken and died. Three other persons died in that house later, the 23rd and the 1st of April, whilst three of my household were attacked; of these one, who was at once removed to another house, recovered. The first had pain and swellings in groin, and then fever; the others, who remained in the house, and in whom the fever preceded the bubo, died. I have seen the opposite of this in many cases. My groom went backwards and forwards to his house in a near village, Chi-tin Sip; he escaped, but his house was the next house infected (without the deaths of any rats as far as I could ascertain); in a week the houses near this house were attacked, rats dying in every case. Meantime the village in which my house was situated was in a deplorable condition, rats dying and dead in the roadway, and the people struck down on every side; there were no other cases then in the neighbourhood of Eng Chuen itself, which I attribute to the situation of the house—it was on a narrow part of the ground between the junction of two rivers which shut it off from the main street that led to the city, and which is the most densely populated part of Eng Chuen. The plague crossed the river in April. An employer in one of the principal shops was a constant visitor at the house; he took it and died after remaining a day or two in the main street. Next an assistant in the shop attached to my house became infected: he insisted on being taken home to his house in the street, where he died; his house seemed to become a centre of infection. The place was densely populated and very filthy; from that place the plague has spread like fire: now the whole neighbourhood in the vicinity of my dwelling has been literally swept by the plague in its most virulent form †. This year's epidemic has differed from last year in that—(1) the bubo has invariably been in the groin save in those persons who sucked the buboes of affected persons and they have developed

† Note.—From a conversation I have recently had with Dr. Crowther at least one-third of the population of some of the villages died of plague.

Name and Reference in Appendix F.	Opinion.
	<p>buboes behind the ears. Last year buboes in neck and axilla were common. (2) Very few pneumonic forms, last year very common. (3) In nearly all the death-beds I have seen the patients have been more violently delirious than last year. (4) The cleanest families have suffered as severely as the overcrowded, filthy ones.</p> <p><i>Notes about the house.</i>—It was an ordinary native one, about 30 rooms, all on the ground floor, divided between my household and a native family, in all about 27 persons. Kept fairly clean, my part being washed out with creosote every three days. Rats abounded, the rat-beater for the village being on the premises. Rats died, and persons were affected with plague as severely as in that part occupied by the native family. The families noted for their cleanliness and wealth have this year been attacked as severely as the worst den in the beggars' quarters. Though the house was situated on low-lying ground between two rivers, and though it had a fine grove of trees attached, mosquitoes were noticeably fewer than in other parts of the city. I just note the fact, as to me it is inexplicable. I send you these few observations. I fear they are of no use.</p>
15. Dr. C. O. SLUMPY, Sio Khoe, Fuk-kien. Page 36.	15. The plague outbreak was preceded by a rat mortality. Filthiness and absolute indifference of the Chinese.
16. Miss M. POULTER, Hok Chiang. Page 37.	16. The utter carelessness of the people crowding in to see the patients, allowing them to travel in sedans with the plague on them, no disinfection, keeping and using clothes, &c., belonging to plague patients.
17. Dr. G. D. VANDERBURG, Nodoa, Hainan Island, Kwantung. Page 29.	17. I am sure that rats are not the only cause of infection. Else how would it spread from village to village when the people carry only a bundle on their shoulders, and in a place like this where there is absolutely no water traffic?
18. Dr. E. C. Machle, Lien-Chow, N.W. Kwantung. Page 30.	18. Germ-infected earth and matter on apparel and other objects brought in contact with open skin of the body is one cause of the spread of the disease; again, insects, as the mosquito, flea, bed bug, fly, and especially the itch mite, are some of the main causes. I cannot say if water, air, and food transport it.
19. Dr. H. DOBSON, Yung Kong. Page 31.	19. Filth, dampness (apparently assisting growth of germ), possibly rats <i>per se</i> . The cases I have seen have been apparently from (1) bites of insects (fleas), (2) contamination of open wounds on legs or elsewhere, (3) through food containing the germ. The last possibly the most frequent and the second in order. In this regard, I should like to call attention to the danger of Chinese wet vegetables, both salt and fresh, especially the salt vegetables, which lay where filth may collect. Dead rats, generally numerous just before outbreak. Chinese seem to look upon this as preceding plague.
20. Dr. J. H. LOWRY, Pakhoi, Kwantung. Page 2.	20. Believes the disease to be infectious. The friends handling and attending to the sick are nearly certain to contract the disease, so are those coming in contact with the breath of the sick.
21. Dr. ABBATUINE, Pakhoi, Kwantung. Page 2.	21. The objection to hygiene, and the well-known filthiness of the Chinese, seem to be the principal factors in propagation.

Name and Reference in Appendix F.	Opinion.
22. Dr. G. G. HORDER, Pakhoi, Kwantung. Page 3.	22. Wearing clothes of deceased persons who have suffered from plague; also dirt, overcrowding, insufficient food, insanitary dwellings. Knows of instances where rats have fled from premises afterwards attacked by plague, in which deaths have occurred.
23. Dr. L. G. HILL, Pakhoi, Kwantung.	23. Overcrowding, want of cleanliness, wearing of deceased persons' clothing, and the like. In the outbreak of 1898 rats died before and during the outbreak in increasing numbers.
24. Rev. Dr. McCLOY, Canton, Kwantung. Page 5.	24.—(1.) Rats. (2.) Persons suffering from the disease and going home to town or village.
25. Rev. Dr. R. H. GRAVES, Canton, Kwantung. Page 7.	25. It is mainly due to rats. I have known it to be caused by eating diseased chickens.
26. Dr. B. N. RINGER, Canton, Kwantung. Page 8.	26. Want of sanitation and all precaution on the part of the Chinese.
27. Miss REGINA BIGLER, Canton, Kwantung. Page 10.	27. Infection developed by insanitary conditions.
28. Dr. A. RAZLAY, Canton, Kwantung. Page 11.	28. Infection, own opinion by the air; transmission, to clothing, by cats.
29. Dr. J. B. J. SWAN, Canton, Kwantung. Page 12.	29. Rats undoubtedly.
30. Dr. A. RENNIE, Canton (1894), Kwantung. Page 13. and Hongkong, 1896-1902.	30.—(a.) Rats contaminating food, and carrying the disease from infected to healthy areas. Wherever plague has prevailed, the association of these rodents with its spread has been noted, and more recently careful bacteriological observations show that the relationship is cause and effect. Wherever a plague rat is found, plague may soon be expected in that locality. (b.) Overcrowding. This condition is more marked in Hongkong than in most Chinese cities. Owing to the mountainous nature of the island, there is but a small fringe of level ground facing the harbour whereon to build, but on this ground, and as far up the mountain side as the slope will permit, houses are crowded together. Built under the lee of the mountain and thus cut off from the free play of the summer winds, separated by narrow streets, and constructed with small stairs and passages, these houses afford little entrance to fresh air and sunshine. Land is dear, and hence houses of two or three stories are common as compared with Chinese cities on the mainland. The number of inhabitants to the acre in Hongkong exceeds by a long way that of any city in the world. Where the population is thus huddled together with insufficient light and air it can readily be understood how a plague-stricken patient affects the other inmates unless speedily isolated. In the earlier days of the Colony houses were too often run up with an utter disregard of sanitary principles. However, since plague became endemic much has been done to remedy this neglect. Ordinances have been formed to regulate the style and structure of the house, the amount of cubic feet

Name and Reference in Appendix F.	Opinion.
	<p>of air for occupants, the height of buildings with reference to the width of the streets, &c.; and with regard to the more recent buildings there is probably little to complain of on the score of sanitation.</p> <p>(c.) Filth. By affording a soil wherein the bacillus may lie dormant, filth undoubtedly plays an important part in the propagation of plague, but probably may, as compared with the two previous causes, be regarded rather as an indirect cause; as compared with the majority of cities in China, Hongkong and even Canton are comparatively clean.</p> <p>(d.) Drainage. Except in so far as drains harbour rats during dry seasons, I am inclined to believe they play little or no part in the causation of plague. Otherwise how can one reconcile the fact that a city like Victoria (Hongkong) with a European drainage system, suffers as severely from the ravages of plague as Canton, where there is no drainage system, unless one applies that name to the open ditches and cesspools and the gutters running under the flagstones of the streets?</p>
<p>31. H. K. SHUMAKER, Honam and Sin-Lam, Opposite Cantong Kwantung. Page 14.</p>	<p>31. The main cause of plague, so far as I can understand, is the passage of an infected individual to a district free of the disease, and in which certain conditions exist favourable to development of the infectious matter, whether that be a germ or not.</p> <p>In Sin-Lam, so far as we can learn, there has never been a death from plague save of individuals who came hither already sick with disease. In a somewhat extensive experience in Honam, I have never seen or known of a second case in a house which was well ventilated, and in which the rooms occupied by victims of disease admitted direct rays of the sun. Am inclined to believe that the infection of plague is like that of enteric fever. That the "poison" after leaving the body of the patient is not virulent until it has met certain conditions, chief among these being absence of direct sunlight. The Chinese assert that blacksmiths and founders never take plague; artificial dry heat would thus seem inimical to development of the disease. On this point, <i>i.e.</i>, the influence of dry heat (sun's), it may be said that Sin-Lam is not closely built, and is exceptionally well drained; few, if any houses, but have sunlight entering at least two sides, and by skylights. Travel, moist heat with absence of sunlight, so far as I understand the matter, are the causes of the spread of plague.</p> <p>It is interesting to note that at Sin-Lam the rats have not been attacked.</p>
<p>32. Drs. WM. ANDERSON, and ANTON ANDERSON, Fatshan, Kwantung. Page 15.</p>	<p>32. (1.) That plague does not travel faster than man. (2.) Tends to follow all trade routes. (3.) It is inoculable.</p>
<p>33. Rev. C. R. HAGER, Districts of San Ning, San Ni, Yan Ping, Hoi Ping, and San Hing, Kwantung. Page 16.</p>	<p>33. Uncleanliness, want of room, want of fresh air, and want of sunlight. I think overcrowding is sometimes worse than dirt.</p>
<p>34. Dr. L. M. MAUS, Commissioner of Health Manilla, Philippine Islands.</p>	<p>34. Rodents introduce the disease, which spreads by direct contagion or inoculation. Experiments conducted here fail to connect the mosquito with the dissemination of the disease.</p>

Plague
outbreaks
in China
preceded by
rat mortality.

12. Apart from the question of the main causes of the spread of the disease, it is worthy of note that of 37 correspondents with experience of plague epidemics, 30, or over 80 per cent., had found the plague outbreak *preceded* by a mortality among rats; 4, or 10 per cent., were of opinion that the rat mortality was simultaneous with the plague outbreaks, 2 did not answer the question, and 1 stated it was unknown, though of opinion that rodents introduced the disease. The consensus of opinion that the rat mortality is a precursor of plague in man is practically unanimous, not only among medical men in China experienced in plague, but among the Chinese people whose villages or towns have been attacked with plague. Dr. A. Lyall refers to this common notion. He states: "It is generally recognised by the Chinese that rats die first. During the year I have often been told that '*men are dying in such and such a street; rats have begun to die in another street, men not yet.*'" Dr. Vanderburg states that: "*The natives who left their villages in a body, and came to our market, say that the rats would be found in the morning dead on the floor, and that they knew it was plague, and hence ran away. Half of their village had died of it before they came.*"

Dr. H. W. Dobson states that: "Dead rats are generally numerous just before an outbreak. *Chinese seem to look upon this as preceding plague.*"

Significance of
rat mortality
preceding
outbreak of
plague.

13. That rat mortality precedes an outbreak of plague is a fact the significance of which is all-important. Were man and rats attacked concurrently at the commencement of an outbreak, the spread of an epidemic would have to be sought in some common media containing the infectious material, and which were likely to affect both simultaneously. But the antecedence of the rat plague points to a channel of infection which is capable of giving the disease to the rat, but which at first has no influence on man, and that dissemination of the infection by the rat is needed to bring it into those channels by which man can become infected.

PART II.

PLAGUE AT HONGKONG, AND THE CONDITIONS THAT FAVOUR ITS CONTINUANCE.

1. The Colony of Hongkong consists of the island of Hongkong, that part of the mainland of China extending some 20 miles north of the island and separated from it by a strait which at the eastern end or Lye-mun pass is only about a quarter of a mile wide, together with the adjacent islands, the largest of which is Lan-tao.

Hongkong
and its
topography.

On the north side of the island of Hongkong, and situated between it and the mainland, is a magnificent bay forming a fine harbour, which can be entered from the east or the west, and is protected from rough weather by the narrowness of the channel on the one side and by the several small islands on the other.

The harbour is capable of accommodating an immense number of ships of every variety. It is a free port, with no customs dues, and there are usually to be seen in it British and foreign warships, large merchant vessels from every quarter of the globe, emigrant ships, large and small coasting steamers, West and Canton river steamers, launches, Chinese junks, and lastly the sampans and boats on which a Chinese population of some 40,000 spend their lives, men, women, and children living in the boats. On the island of Hongkong there is the City of Victoria, with a population of 200,000 inhabitants, the small town of Aberdeen, and a number of villages; while directly opposite, on the mainland, on a portion of the narrow peninsula jutting southward which is some 5 miles in extent, is situated the town of Kowloon, with a population of nearly 30,000.

Until 1899 the Colony of Hongkong was limited to the island, the harbour, and the Kowloon portion of land. The centre of life and of business is still confined to the City of Victoria and the town of Kowloon, and does not extend to the new territory, which is but sparsely inhabited.

The City of Victoria faces the harbour, and is situated on the northern side of the island of Hongkong, which rises almost immediately from the sea, first in a gentle slope, then in steep ascents, to a height of 1,800 feet. It is on the lower slopes that the city is built. Above the city are several very fine roads on the hill-side leading to houses, the foundations of which have with great labour and ingenuity been cut out of the hill-side. They are occupied by Europeans. Still higher above these, on the summit of the Peak, are other European houses. The approach to the houses on the hill-side and the Peak is made easy by a funicular tramway. From the harbour the city and higher houses present a very picturesque appearance. The City of Victoria is narrow by reason of the conformation of the available land on which houses can be built, and extends along the sea-front for a distance of $4\frac{1}{2}$ miles.

The contour of the harbour frontage, more especially the eastern side, is marked by curves and indentures. Formerly that of the western side presented

similar features, but they were lessened or obliterated by extensive reclamations which have added considerably to the amount of available land for building on. A scheme of reclamation is now proposed for the eastern side which, when carried out, will provide a like result.

The building of a large city on so small a strip of land has necessarily been attended with great difficulties and with results which are far from being satisfactory from a health point of view. The streets are narrow, with the exception of those on the reclaimed land and skirting the harbour; the houses are high, closely built together, often constructed back to back or close to the hill-side, or only separated by narrow lanes, and the rooms are arranged to provide accommodation for an exceptionally large number of persons.

The drainage of a city such as this presents many difficulties, but these in the main have been overcome. There are surface drains for the storm water, which at times is very torrential, and there is a system of drainage from a number of the houses which discharges itself into sewers. Both underground sewers and surface drains discharge into the harbour, in which the tidal currents are strong. Some of the storm water drains have been covered over and probably lost sight of, and there is a likelihood that in a number of instances drainage from houses discharges into them. On the whole, however, as far as system and construction are concerned, the drainage of Hongkong is good. It, however, requires arrangements for regular inspection, cleansing, flushing, &c. The water supply is good so far as it goes, but limitation of gathering ground, together with the necessity of storage for long periods during the dry season, combined with the great demand on the supply owing to all the floors of the houses being connected with the mains, leads to an annual scarcity which, in a particularly dry season such as 1902, amounted to a water famine. The quality is excellent, but, as pointed out in my preliminary report of 20th March, 1902, the reception of the filtered water into an open reservoir instead of into a covered one at Albany Road renders it liable to pollution.

Hongkong
an entrepôt
for goods.

2. The proximity of Hongkong to China, and to the estuary of the Pearl or Canton River, gives it a very intimate connection with Canton. For the purposes of trade, the Chinese resort in large numbers to Hongkong, which is an entrepôt for the transit of Chinese commerce. Its warehouses are full of the produce of nearly every country waiting to be taken into the Provinces of Kwantung, Kwangsi, Yunnan, and Fukien, and, in exchange, the produce of these provinces is stored in Hongkong ready for export. The Colony is one vast depôt of cotton, flour, rice, sugar, oil, spices, teas, dried fish, and other merchandise. It produces little in itself; there are only a few factories, and it is dependent on Canton for its food supply. The population of Hongkong itself is mainly Cantonese, consisting of traders and a large proportion of the labouring class; it is floating in its character, non-residential, and largely made up of males whose wives and families remain at home in the villages of China. There are nearly 1,000 registered lodging houses in the City of Victoria, and the great majority of the other houses are tenement houses. Under these conditions, the epidemic diseases of Hongkong synchronize to a very great extent with those prevailing in the chief centres and villages of Southern China.

3. From the facts related it is clear that plague in Hongkong was derived from Canton or its environs. This is an important fact which has generally been overlooked in Europe. It is not uncommon even amongst those who have paid special attention to plague to meet with some who are under the impression that plague started as it were *de novo* in Hongkong, and remains there as the only focus of danger. An impression of this kind has been produced in consequence of plague having been first heard of in Europe as an epidemic in Hongkong, and subsequent attention having been directed to its annual recurrence, owing to the circumstance that every case in Hongkong is reported in the daily papers and a weekly bulletin is issued and sent to the different Governments interested in the Venice Convention, whereas cases of plague in Canton, its neighbourhood, the Province of Kwantung, or other parts of China, receive no publicity and form no subject of report either to the local or the Imperial authorities of China or to foreign Governments. Silence has been erroneously interpreted by those unacquainted with the actual state of affairs in China as an indication or proof that the country is free of plague.

The plague of Hongkong was derived from Kwantung.

As a matter of fact the whole of the southern coast of China, including the Provinces of Kwantung, Kwangsi, and Fukien, is more or less in some parts infected with plague, as well as the eastern coast as far north as Foochow, which suffered very heavily from plague in 1902, losing, it is stated, some 30,000 persons. Farther north the country is free until Manchuria is reached, where, at Newchang and some of the more inland places, plague has shown itself.

With no statistical data to go upon, it is impossible to state in definite terms the mortality from plague in any one of these places. In Canton, as elsewhere, the only index to the mortality caused by an epidemic is the number of coffins that may be required above the ordinary demand, and which may be counted when carried through the gates. This rough method suffices to give an approximate estimate until panic seizes the inhabitants and there is a general exodus. Canton has in no year since 1894 been free of plague. There has been an annual recrudescence in spring and summer varying much in intensity in different years. For instance the recrudescences of 1896, 1898, and 1901 were very severe compared with those of 1895, 1897, 1899, 1900, and 1902. Next to the epidemic of 1894, which has already been referred to, those of 1896 and 1898 were the most severe.

Dr. Swan, for many years in charge of the American Missionary Hospital in Canton, endeavoured to estimate the mortality of the epidemics of 1896 and 1898 by obtaining information as to the number of coffins which passed through the gates. His estimate is that in 1896 there were probably 40,000 deaths from plague in Canton. The epidemic began in March and continued till July, creating great alarm and causing large numbers of the population, rich and poor, to leave hastily for the country. In 1898 it is estimated that another 40,000 of the inhabitants died of plague, and at the height of the epidemic a similar exodus took place. In 1901 the epidemic, though next in order of severity, was not nearly so destructive as those of 1898, 1896, and 1894. It affected the surrounding villages more than the town.

Nothing is done in China to mitigate the effects of any infectious disease, and plague is no exception to the rule. When the mortality becomes

high the well-to-do leave the locality, and the poorer people flee to another quarter or go back to their native village.

The Hongkong epidemics much less severe than those of Canton.

4. The recorded mortality from plague in Hongkong does not at any time approach in proportion the mortality of Canton.

The deaths since 1894 are as follows :—

1894	1895	1896	1897	1898	1899	1900	1901	1902
2,485	36	1,204	19	1,325	1,487	1,086	1,637	540

These numbers are not to be taken as representing the actual mortality from plague contracted in Hongkong, because immediately a Chinaman feels sick he will, if possible, go home to his native village. He sometimes dies on the way, even before he reaches Canton. For instance, in 1901, from May 24th to the end of June, in a period of five weeks and two days, the custom house officers at Canton detected 160 cases of illness from plague, and also found 35 persons dead of plague among the passengers on steamers from Hongkong. The voyage takes from eight to ten hours. In the same year, in one firm which endeavoured to trace the cause of nearly 25 per cent. of its workmen having left on account of sickness, no fewer than 20 per cent. were discovered to be cases of plague, giving on the total establishment, as far as could be ascertained, a mortality of at least 3 per cent., and an incidence of plague of $4\frac{1}{2}$ per cent., while the recorded mortality for the Colony was a little over 5 per cent. during the same period. In another firm in which ten, or 3 per cent. of the men died of plague in 1901, only three died in Hongkong, the other seven died in China.

Seasonal prevalence of plague in Hongkong.

5. Plague in Hongkong possesses distinct seasons for its prevalence. It is lowest or even absent in the autumnal and winter months, and reaches its maximum in the summer months, especially in May and June. Dr. Clark, the Medical Officer of Health for the Colony, at my request has kindly drawn up the appended chart, showing the weekly prevalence of the epidemics since 1896. It will be observed that the figures for four of them, *i.e.*, for the years 1896, 1898, 1901, and 1902, reach their maximum before the 24th week, and that the other two, *viz.*, the years 1899 and 1900, after reaching a maximum about the same time as the others, differ in their later behaviour in that, after a decline, they again rise even to a greater height than before. This second rise reaches its height by the 26th week at the latest.

There were from January to the end of June :—

In 1896 no fewer than 1,116 out of 1,204 for the year, *i.e.*, 92 per cent. of the cases.

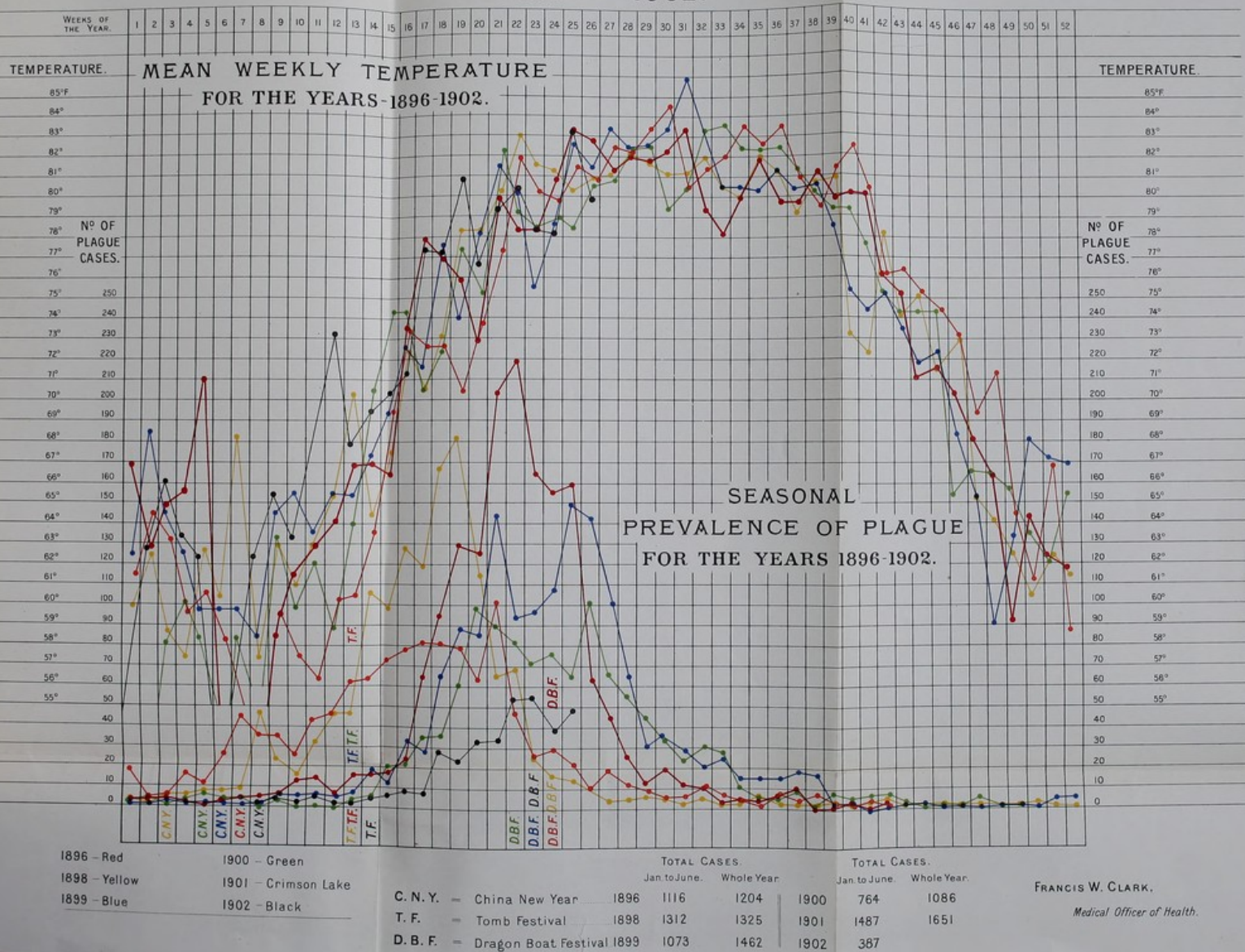
In 1898, 1,312 out of 1,325 for the year, *i.e.*, 99 per cent. of the cases.

In 1899, 1,072 out of 1,462 for the year, *i.e.*, 72 per cent. of the cases.

In 1900, 764 out of 1,086 for the year, *i.e.*, 70 per cent. of the cases.

In 1901, 1,487 out of 1,651 for the year, *i.e.*, 90 per cent. of the cases.

DIAGRAM SHEWING MEAN WEEKLY TEMPERATURE AND SEASONAL PREVALENCE OF PLAGUE IN HONGKONG FOR THE YEARS 1896 — 1902.



No epidemic lasts longer than from twelve to sixteen weeks, three months being about the average. If an epidemic begins early it ends early; and if it begins late it ends late. Though the rise and height of the epidemic correspond as a rule with the beginning of the rains and that period of the rains when the temperature is below 80° F., and the decline begins generally in the middle of the rainy season when the temperature is above 80° F., yet it is to be noted that in the two worst epidemic years, 1898 and 1901, the decline had no apparent relationship to any continuous temperature over 80° F., having begun before that temperature was reached.

There appears to be no special connection between the behaviour of plague and the rainfall. If the rain has any influence, it is perhaps on the executive and the carrying out of measures for the prevention of the spread of plague. It tends to prevent the continuance of those active measures against the spread of plague which are carried out in fine weather. It is more difficult to get the coolies to work, they need more supervision, while cleansing and disinfection operations are carried on under many difficulties.

The explanation of the seasonal prevalence of plague must at the present stage of our knowledge be purely theoretical, and as such will not be dealt with in this report. There can be little doubt, however, that the seasonal prevalence in Hongkong is favoured by one or two circumstances which occur about this time. First of all, in the early part of the spring there is the tombs festival, which attracts to China large numbers of Chinese from Hongkong to perform ceremonial rites at the tombs of their ancestors. If plague is prevalent in the part visited there is risk of infection, which is brought back on their return to the Colony. Next there is the extra activity of the business of emigration at this time of the year, which brings thousands of Chinese coolies to Hongkong, sometimes from infected localities, to await their turn to be taken in emigrant ships to ports which require Chinese labour. As no sanitary control is exercised over the movements of these incomers from China, both of them contribute to a continuance and rise of plague during the season. The influence of these two factors is of secondary rather than of primary importance as matters now stand in Hongkong, for, though re-infection of the Colony from China plays a part in the annual recrudescence, more or less, according to the extent of plague prevalence and to the accessibility of the area affected in the Kwantung Province, yet the main source of plague in Hongkong since 1898 is in the Colony itself, where it is endemic, and where it would appear annually even if it were not materially assisted by re-infection from the mainland.

6. The accompanying plan with spots marked on it represents infected houses in one part of the town since 1896, and that part not the worst. The different colours which will be seen by a magnifying glass represent different years. Seeing that between 30 and 35 per cent. of the cases of plague are found in the street and not traced to any house, the plan, notwithstanding this defect, indicates a fairly adhering infection to certain lanes and houses.

When a case of plague has once occurred in a house, there is a great tendency in subsequent years for the same house, or that adjoining, or that on the opposite side, or that close by, to be attacked with plague. When plotted

Plague
endemic in
Hongkong.

out on a map, the distribution of plague appears to be closely connected with previous infection of the house or of a defined locality, the infection having been retained in an unrecognised form in the interval. Inquiry into individual cases very often supports this view. The distribution of rat plague also presents similar features. If rats are dying in a house, it is not infrequent to find that the same phenomenon was observed in the same or in a neighbouring house the year previous.

The infection
adheres to old,
dark, damp,
and rat-ridden
houses.

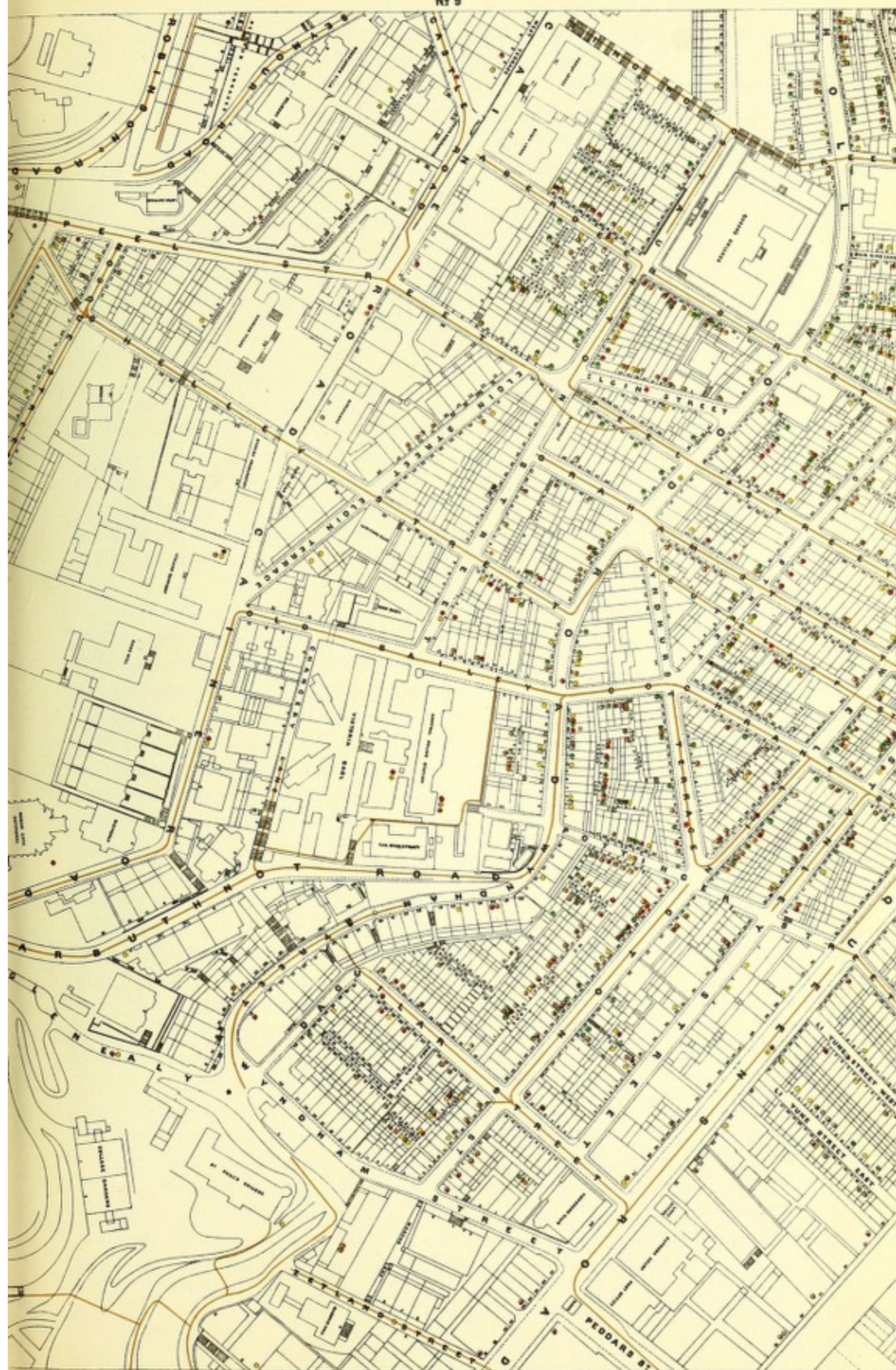
7. The houses which suffer principally are, speaking generally, the most insanitary and the oldest. It has already been mentioned how closely packed the buildings are in the older portions of the town, narrow streets and high houses being the leading features, by which the admission of sunlight and fresh air is considerably obstructed. Narrow streets and high houses, however, are not peculiar to Hongkong; they are to be found in other towns, with their injurious effects on health; but in Hongkong there is, moreover, in the Chinese quarters, a defect in the construction of the houses which intensifies the obstruction of light. The rooms are long and narrow, with a window at each end, the front window looking into a wide and covered verandah, and the back window into a small open space at the back which forms a sort of well between two houses. The lower floors of many of the houses are remarkable for their darkness, and this in a region not far from the tropics; they are also frequently damp.

Since the epidemic of 1894, many of the lower floors of the worst kind have been changed into store-rooms to contain the goods and merchandise for which Hongkong is an entrepôt. These store-rooms as a rule are infested with rats, which at times find their way up to the rooms on the higher floors. The basements are generally rat-ridden, both floors and walls, and from the walls being often hollow it is easy for rats to reach the upper floors.

The admission of sunlight into the dwelling rooms of Chinese tenement houses is still further obstructed by the subdivisions into several cabins or compartments, sometimes numbering up to six, which every room is subjected to. Each cabin is let out to a separate tenant and not infrequently accommodates a separate family. These compartments or cubicles are windowless rooms, and are often so dark that it is impossible for anyone, coming directly from the light outside and drawing the curtain or opening the door of the cubicle, to see at once whether it is occupied. I have stood at the entrance of one of these cubicles and peered in, trying to discern what was in the dark room, and suddenly been startled by discovering that not more than a foot from me was some occupant, whom at first sight it was impossible to see on account of the darkness. Some attempts have been made to improve this state of things by limiting the height of the subdividing walls to 6 feet. The condition which obtained before this improvement was made it is somewhat difficult to realise, for what I am describing is that which now exists. Fresh air and sunlight never get into the cubicles except perhaps the compartment at each end of the room opposite the window. The subdivision of a single room into a number of rooms called cubicles is an ingenious device for crowding together a large number of people into a small space and securing a correspondingly large rental, but it is an arrangement which engenders disease and favours its spread.

COLOURED SPOTS SHEWING PLAGUE INFECTED HOUSES IN ONE DISTRICT IN THE YEARS 1896 - 1901.

- PLAGUE INFECTED HOUSES IN 1896.
- PLAGUE INFECTED HOUSES IN 1899.
- " " " 1898.
- " " " 1900.
- PLAGUE INFECTED HOUSES IN 1901.



N 10

VICTORIA HONGKONG SHEET N 11.

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There is no doubt whatever that every such windowless cubicle is unfit for human habitation, and should not be permitted.

Further details concerning the insanitary housing in Hongkong are given in the conjoint report submitted by Mr. Osbert Chadwick, C.M.G., and me, to the Hongkong Government in May of 1902, and, as it is important and bears largely on the continuance of plague in Hongkong, it is included in the Appendices of the present report. Appended also are some notes on the condition of a few rooms which Dr. Pearce, the Assistant Medical Officer of Health, kindly collected for me.

The cubicle system leads to overcrowding in its worst form and under the worst conditions, for wherever more than two cubicles are in a room the compartments become so dark as to render it impossible for them to be kept clean.

Apart from the detrimental effect which the absence of fresh air and sunlight has on the general health of the occupants, the darkness, by favouring uncleanness and other insanitary conditions, is an important factor in the spread of an infectious disease the causal agent of which is not infrequently discharged in the excretions and sputum of the patient. Were it not that it is the custom in many instances for the people in the room to take to flight immediately one of their number is ill or dies of plague, there would be, under the pernicious conditions mentioned, even more serious results.

8. Probably another cause for the continuance of plague, besides the insanitary condition of the houses referred to, is the very inadequate number of latrines and urinals with which Hongkong is provided. The urine and faeces of many plague patients contain plague bacilli before they take to bed, and, with the want of urinals and latrines, infectious material gets distributed on the ground, and in places where the bacillus finds favourable conditions for permanent growth and often none for its destruction and removal. The number of public latrines appears to be 29 belonging to the Government and 17 to private owners. The total number of seats is 1,202; most of them have urinals attached, and in addition there are three small public urinals in the town. Seeing that all the men and boys go to public latrines, and there are no sanitary appliances in the houses except earthen pots, which are used exclusively by the women and children, the total inadequacy of the latrine accommodation provided is obvious. It is not one seat to 100 of the male population. On the Kowloon side of the Colony the latrine and urinal accommodation is still more deficient. Large blocks of houses have been built, and not a single latrine or urinal provided by the builder of the block. It is impossible under these circumstances that the ground should escape being sewage-polluted. The offensive smells complained of by the public are not from the filthy habits of the coolies, but from a want of public conveniences in which they can relieve the necessities of nature. Were it not that the daily scavenging of the streets and lanes under the Medical Officer of Health is exceptionally good, the evidence of the want of latrines would be much more perceptible than it is. A tally was made of the number of persons using the 40 seats of the Winglok Street Government latrine on the 11th of March, 1902, and it was found that 3,445 persons used the seats in the twenty-four hours and 2,697 the urinals. If the other

Insufficient latrine accommodation and the insanitary condition of many of the existing latrines probably favour the endemicity of plague.

latrines in town were used to the same extent, not more than a little over 90,000 persons could have gone to the latrines and 70,000 to the urinals in the twenty-four hours, which is far short of the population supposed to go to the latrines. The existing latrines are far from being models of what they should be. They are, in fact, insanitary in structure and deficient in light and ventilation. By their imperfections they attract rats, and, as the Chinaman contractor is reluctant to mix disinfectants with what as a farmer he views as a valuable commodity, the rats on occasion do not escape being attacked with plague, and carry the disease into houses close by.

The varieties of type of plague in Hongkong and the probable channels by which each affects the system.

9. The varieties of type of plague in Hongkong in 1902 may be gathered from the following table, which represents the number examined bacteriologically between March 16th and July 16th :—

Type.		Number.	Percentage on the Total Number Examined.	
Septic	...	126	...	40
Pneumonic	...	13	...	4.1
Bubonic	Axillary	68	...	21
	Femoral	101	...	35.4
	Inguinal	2	...	0.6
				55 per cent.
		310		

The septic were nearly ten times, and the bubonic thirteen times, more numerous than the pneumonic. This percentage probably represents approximately the difference in frequency of the channels by which the virus enters the human body.

The comparatively small number of pneumonic cases is fortunate, for this variety of the disease, being highly infectious from the sputum being crowded with plague bacilli, is particularly dangerous to those who come in contact with the patient. The few cases which were traced showed great infectivity. Forty per cent. is a high proportion for the septicæmic variety. It will be shown in another chapter that feeding animals with plague-infected food causes septic plague in the animal, and it may be asked if the alimentary canal is not the most likely channel for the causation of septic plague in man. Certainly a number of the post-mortem examinations favour this view, the retro-peritoneal and mesenteric glands, as well as the mucous membrane of the stomach and intestines, being affected.

The manner in which the food probably becomes contaminated will be dealt with later on. No facts were observed to indicate that the bubonic variety of plague was otherwise caused than through the ordinarily accepted channel of the skin, inoculation of the hand or arm being somewhat less frequent than that of the foot or leg. The apparent seat of inoculation was in a few instances marked by a vesicle or bleb, which contained plague bacilli.

Plague in Hongkong in 1902.

10. In 1902 the first reported case of plague in Hongkong occurred on the 16th of January in a Chinawoman who was suffering from a bubo in the armpit; she was removed to hospital, but died the next day. Her residence at the back joined on to a house which had had two cases of plague in a

previous year. Its east side abutted on another house, which had also in a former year been affected with plague, while its west side was next to a house in which there had been five persons attacked with symptoms corresponding to plague early in January, and who had fled to China. It was reported that three of the five had died. A plague-infected rat had been found a fortnight earlier a few yards away from the house. If the woman had not been the wife of a respectable Indian, it is very probable that the sanitary authorities would not have learnt of her illness at first hand, any more than they did of the five other cases. The block in which the house is situated contains twenty houses, and in four of them during the process of cleaning twenty-two dead rats were found between the ceiling and floor of the lower and upper rooms. The walls of the houses were hollow and riddled with rat holes, the space between the hollow walls being evidently used as rat runs; in fact there was no obstacle to prevent rats entering at one end of the block and passing from house to house to the other end. The basement floors of the houses were mostly of concrete, which formed a protection against the entrance of rats into the rooms from under the floor, but the gain in this respect was lost by the hollow walls and covered-in ceilings, which served as excellent shelters for rats, infected and healthy. As the block and the locality possess an evil reputation for plague, the twenty houses were vacated until they were repaired, accommodation for the inhabitants being provided by the Government in a new block of buildings close by, hired for the purpose. There was no case in this neighbourhood after this until the end of May.

The next case reported was that of a Portuguese boy at school, who was attacked with plague in the last week of February, and which proved fatal. He suffered from a bubo in the groin. The source of infection was not traced. The relatives removed to the grandmother's house, and in two months' time there was a second case of plague among them. There is reason to believe that a number of articles of clothing were taken from the house before disinfection. The next case was found in the street, and no trace of the house from which the body had been taken and deposited in the street could be discovered. The fourth was a Portuguese boy who was attacked with pneumonic plague. The case gave rise to two others, obviously due to infection. The house was one in which a large number of rats had died under the floor in 1901.

11. The arrival about this time of Dr. Hunter, the bacteriologist for the Colony, rendered possible the daily examination of a small proportion of the rats found dead in the street in different parts of the city, and this examination disclosed the fact that a small percentage of the rats in certain quarters of the city were infected. Later, a daily examination of the rats caught in cages or found dead was made on a much more extended scale by three of the Japanese medical men who were engaged by the Government of Hongkong to assist in the medical management of the plague. The method was most valuable in locating infected centres and infected houses, and as time went on it was evident that what had been observed in the towns and villages of China, with reference to the rat mortality *preceding* plague, was also true in Hongkong, and that plague-infected rats in a house or locality meant sooner

Relation of
rat plague to
human
plague.

or later, if immediate measures of prevention were not taken, cases of plague in that locality or house. The dissemination of plague in Hongkong by rats is even a more influential factor in the spread of plague than its dissemination by man, not because man is not infective, but, as a rule, he can be dealt with by the sanitary authorities, but the rat problem is much more difficult to deal with.

In the plans of the town attached, the cases of plague which occurred in 1902 to the end of June are marked with a square in the houses and localities in which they were found, and the cases of plague-infected rats are similarly marked on the plan with a circle. In each square and circle is given the week in which the case of human plague or rat plague was discovered, and if these plans are examined with a magnifying glass it will be seen how very frequently rat plague in the vicinity preceded human plague, and the great preponderance of rat plague over human plague. If sheet No. 26, which represents one of the most eastern parts of the town, be examined, it will be seen that in Keswick Street a plague rat was found in the 15th week, another in the 18th week, and a third in the 23rd week; a case of plague occurred in a boy in the 31st week, in a house adjoining that opposite which one of the plague rats had been found. In Irving Street plague rats were found in the 16th, 24th, and 27th weeks, and a plague case occurred in the 29th week.

In No. 22 sheet plague rats were found in Jardine Bazaar Street in the 14th, 21st, and 27th weeks, and cases of human plague in the 29th and 30th weeks. The case of plague in the earlier period in Jardine's Bazaar has already been referred to,

If No. 4 sheet, which represents a locality in the western part of the town, be now examined, it will be seen that the first infected rat was found in Yat Foo Lane, in the 16th week; that the first case of plague occurred in the 17th week, at No. 5, Belcher Street, which is a house in which plague occurred the previous year, in 1901. On cleansing the block of houses on the same side there were caught in a house, three doors away, nine rats, and of these no fewer than five were infected with plague, and in another house, a few doors further away, two plague-infected rats were found. The next cases in the neighbourhood were in the 18th and 19th weeks, at No. 468, 478, and 502, Queen's Road West, all in one block. The first had been living in a house in the block which had had cases of plague in it in 1901, the second had no distinctive history, while the third occurred in a house the lower floor of which was used as a slaughter-house, and in which forty-six rats were caught, three of which were affected with plague. This house was next door to one in which plague occurred in 1901. In the 18th and 19th weeks, plague rats were also found at the end of Queen's Road West, not far from Belcher Street, and it will be observed that plague cases occurred in the block in the 23rd and 24th weeks. On the opposite side of Queen's Road West, a plague case occurred at 582 in the 23rd week, a plague rat having been found opposite 578, two doors away, in the 18th week. A plague rat was found in No. 5, Third Lane, in the 20th week, and a plague corpse was found in the lane in the 21st week.

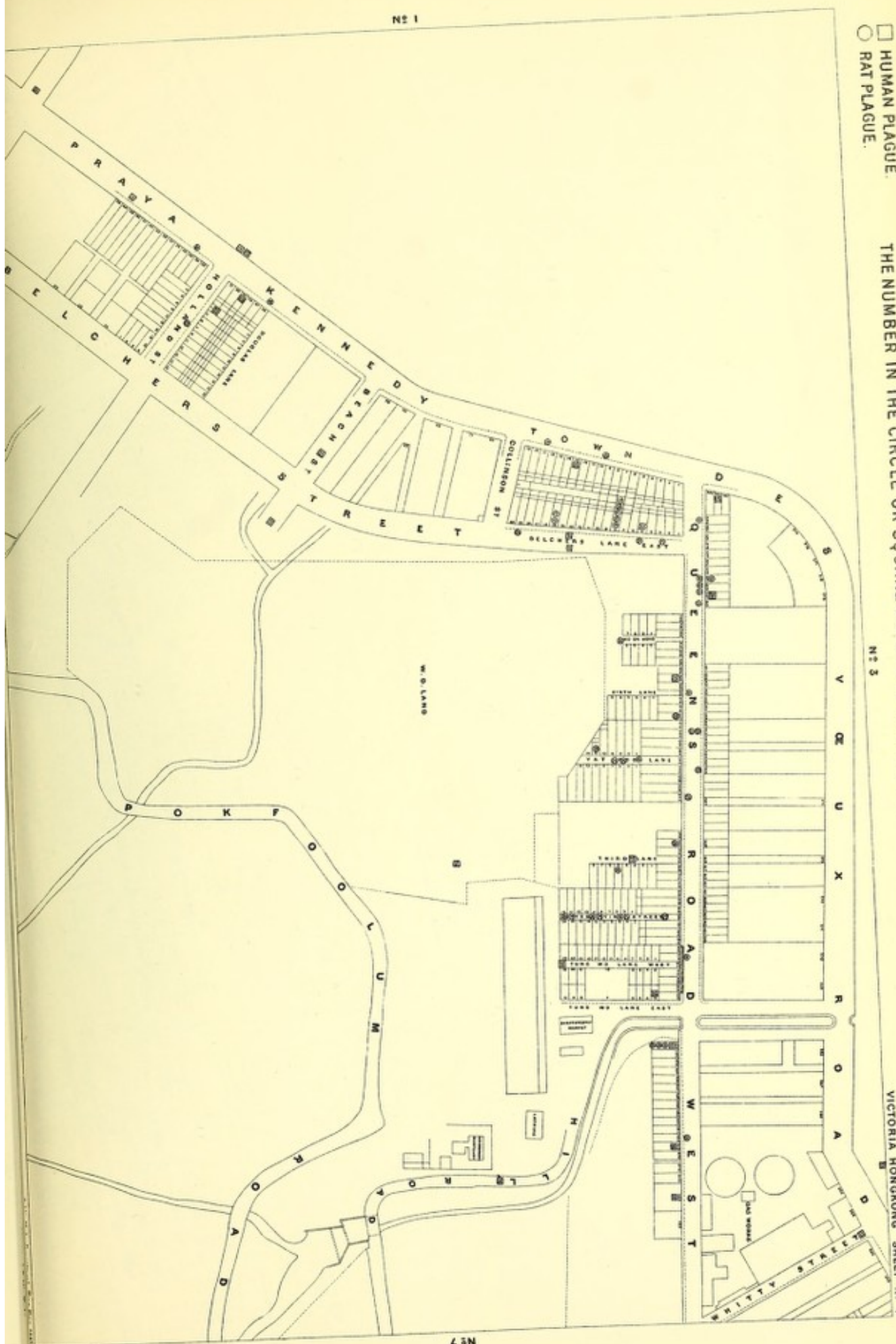
Coming to a more populous locality, it is seen in sheet No. 6, that a group of plague cases centre round Pokfulum Road and Second Street.

☐ HUMAN PLAGUE.
☐ RAT PLAGUE.

THE NUMBER IN THE CIRCLE OR SQUARE REFERS TO THE WEEK IN WHICH THE CASE OCCURRED.

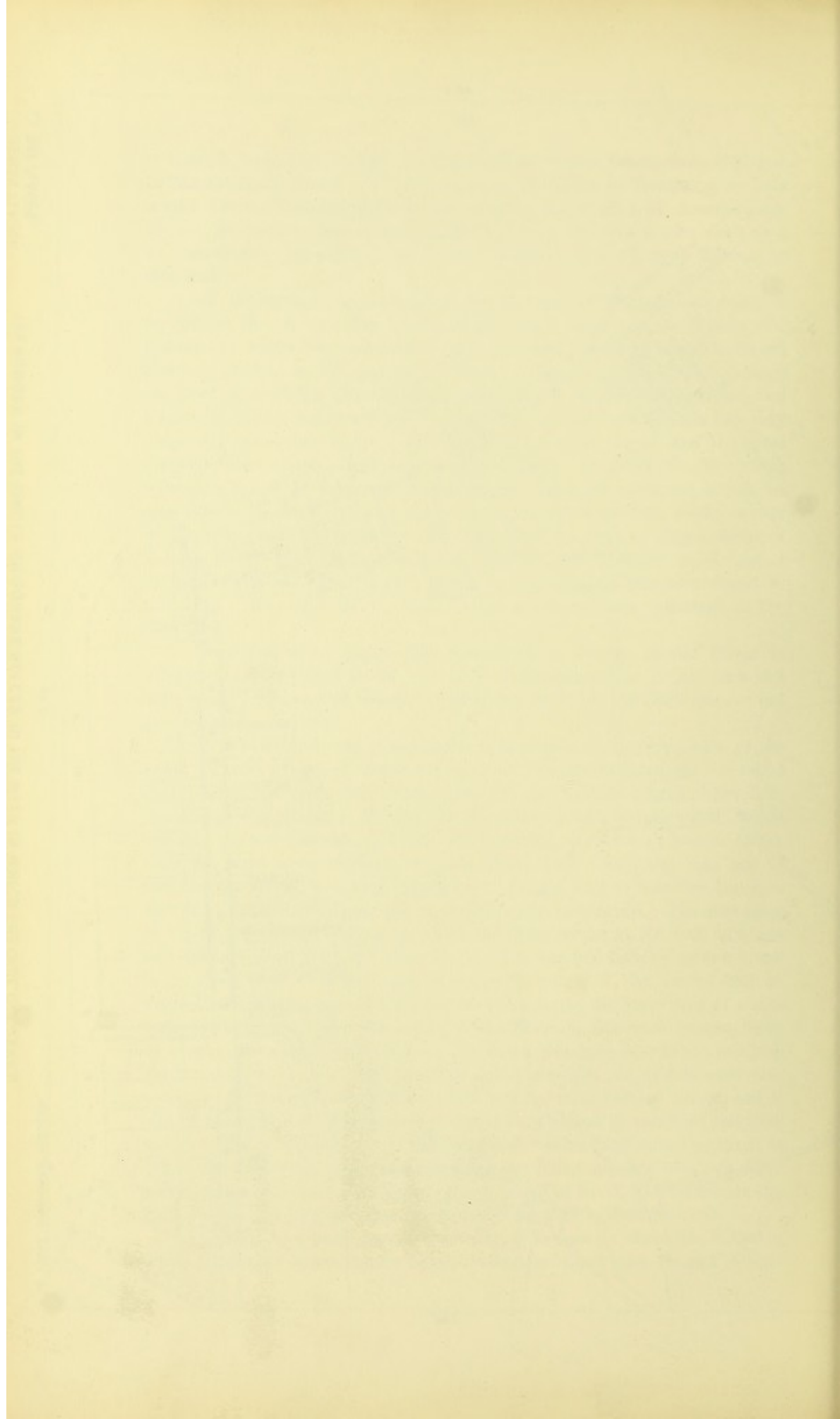
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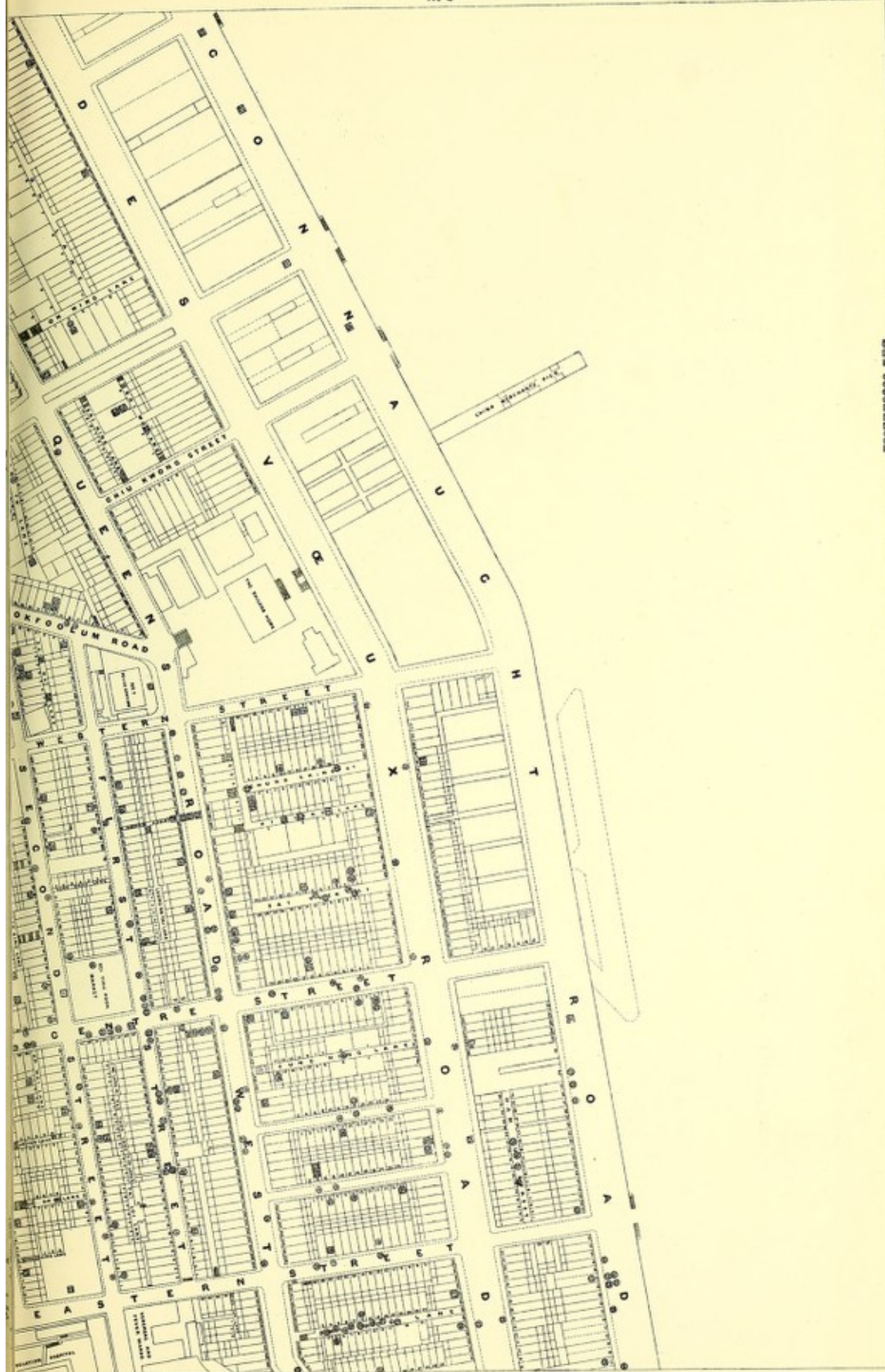


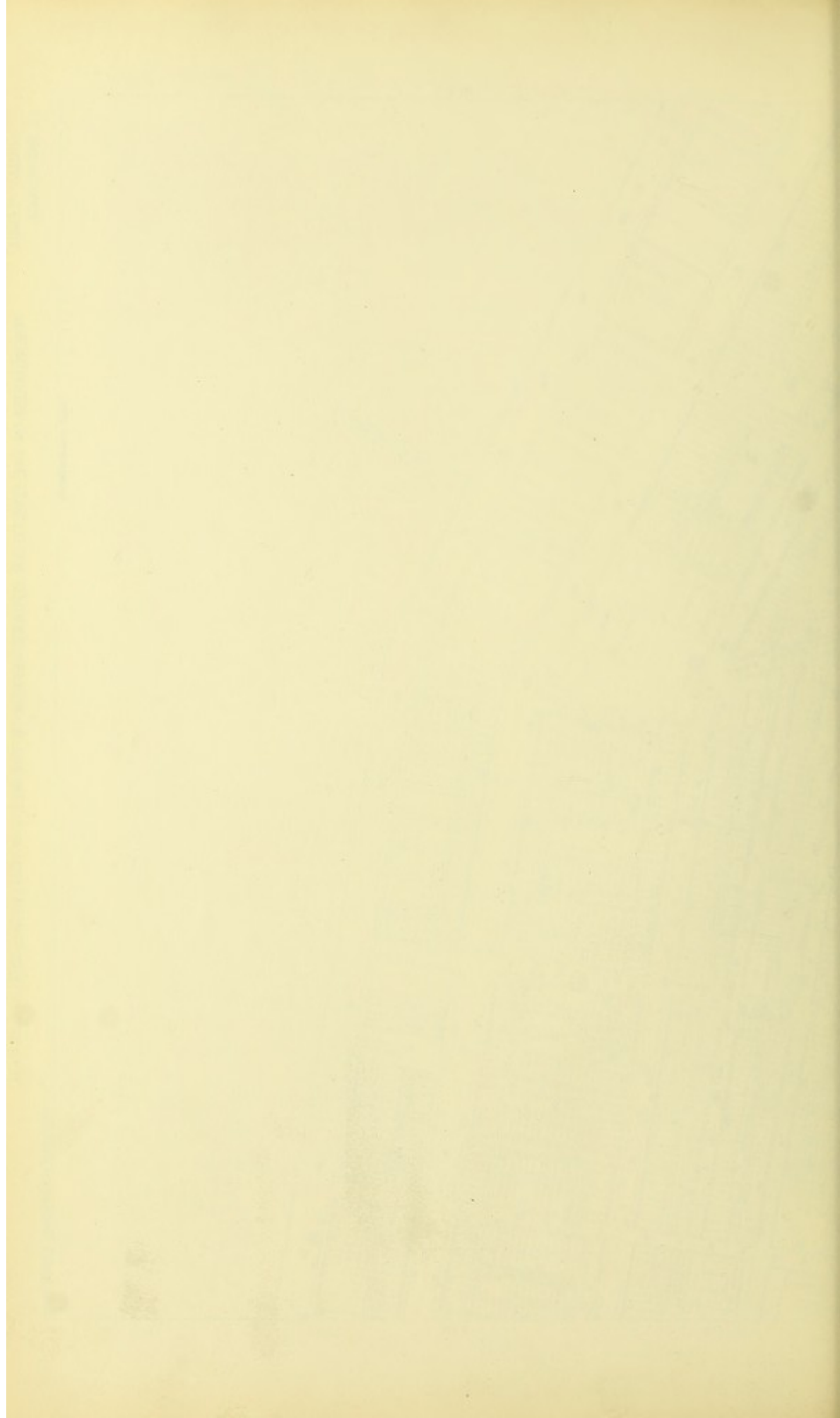
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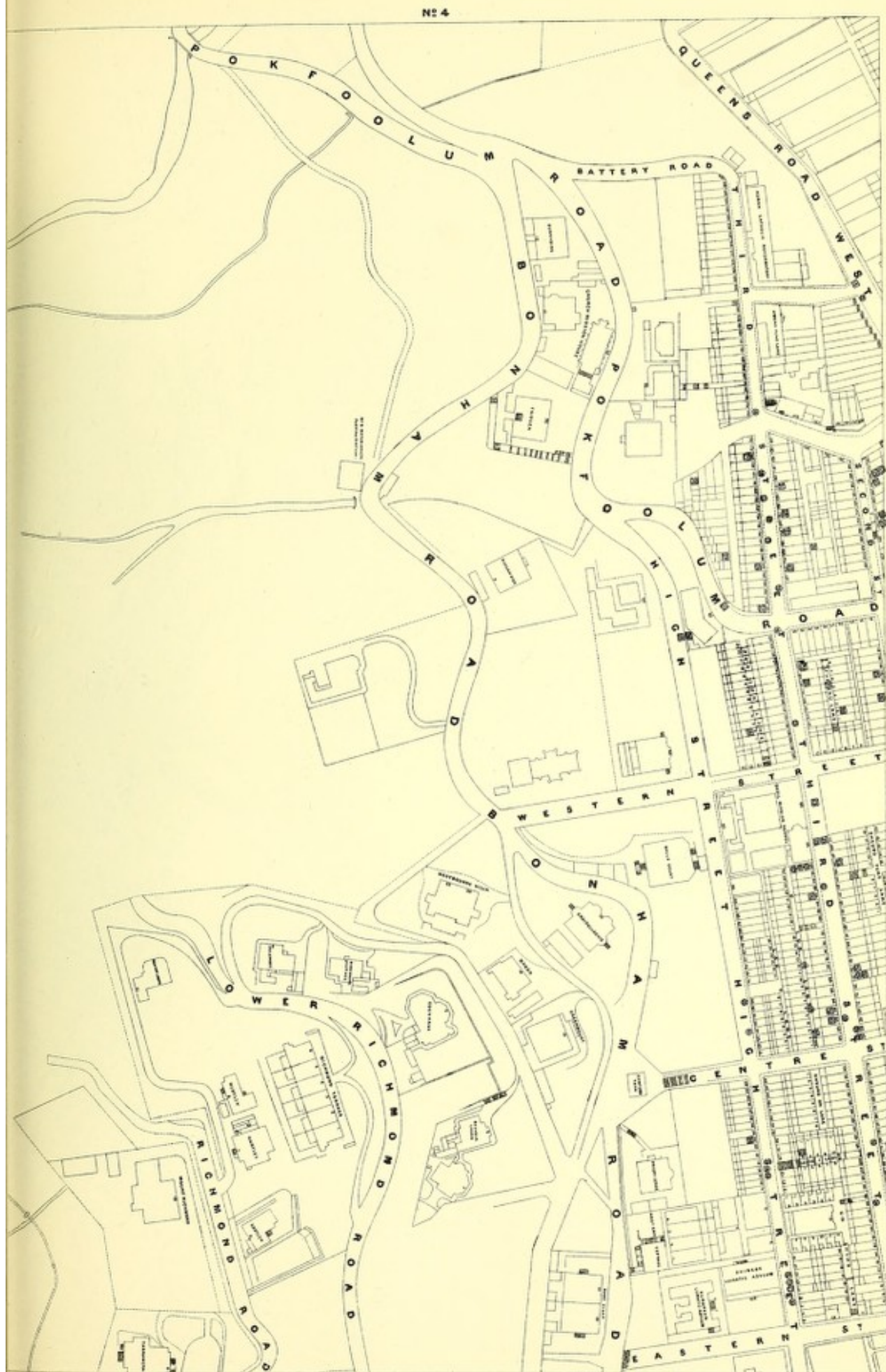


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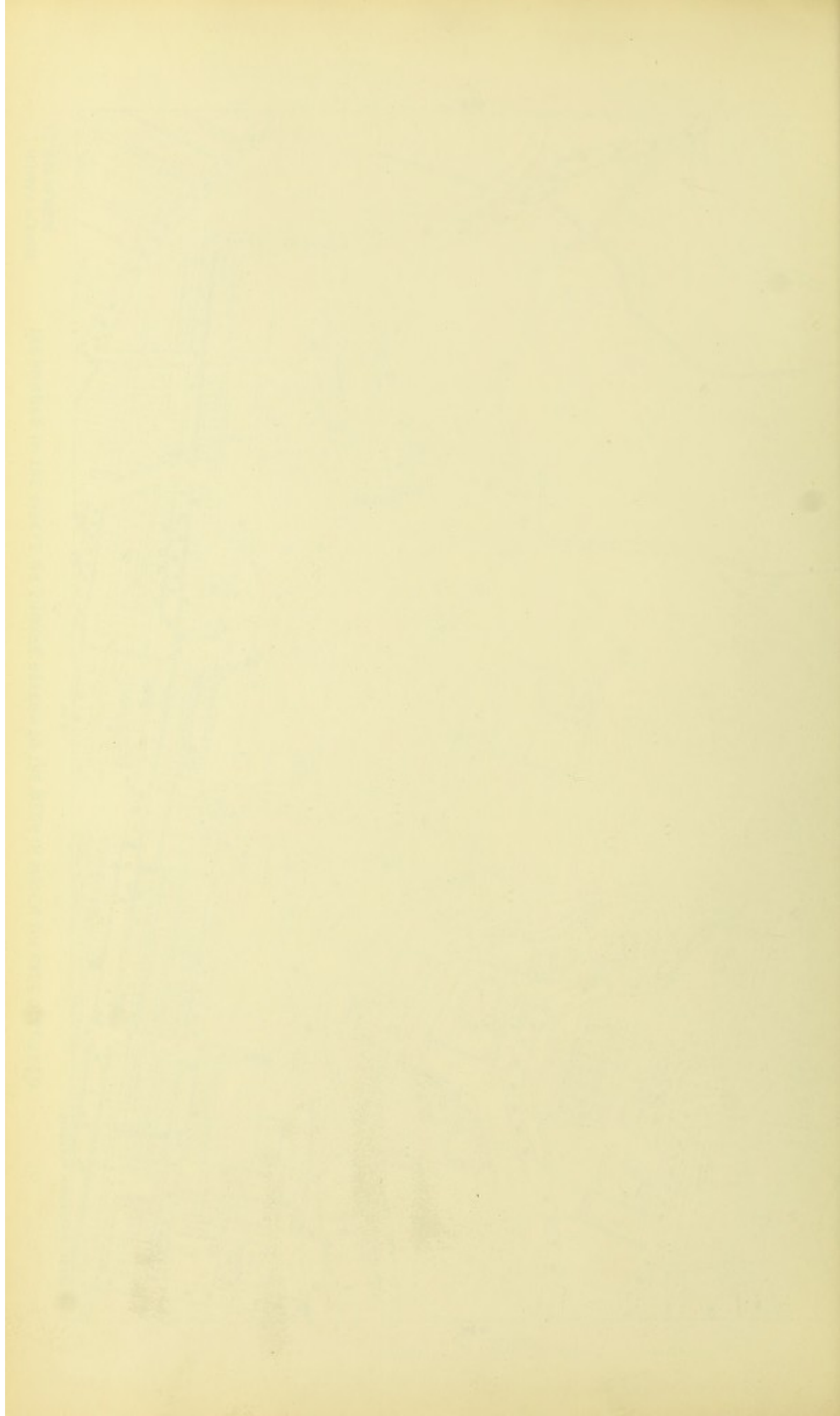
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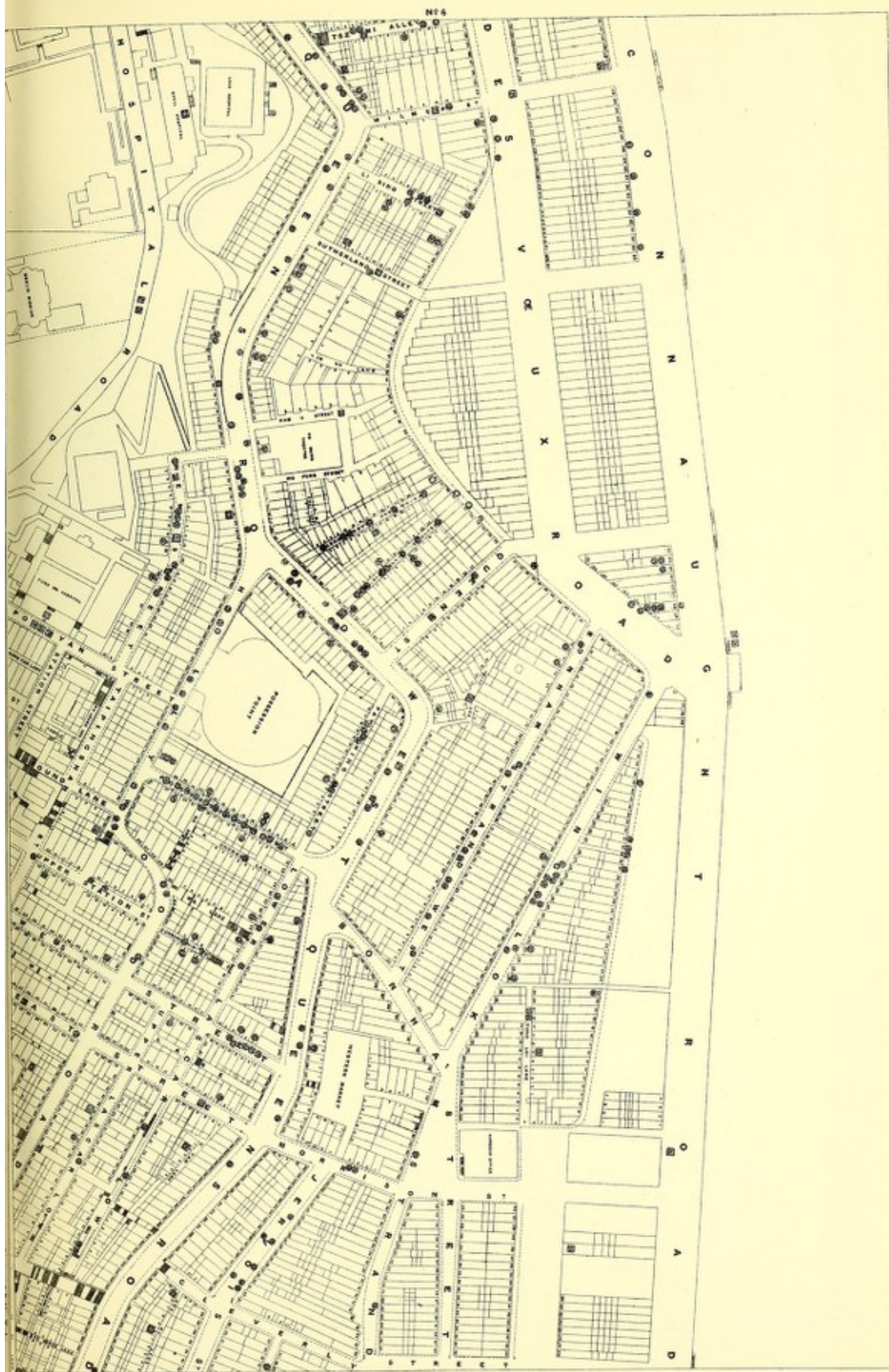
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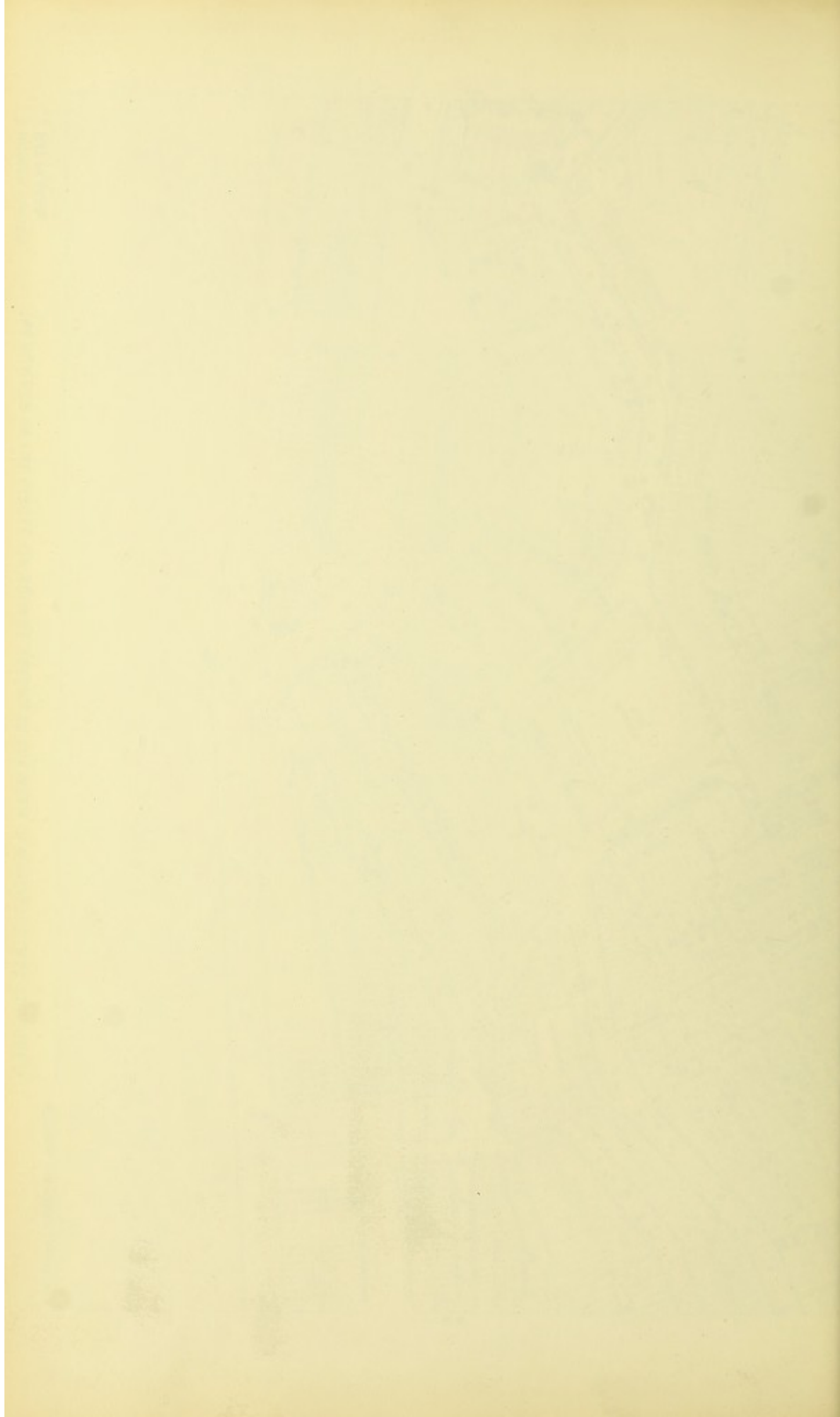


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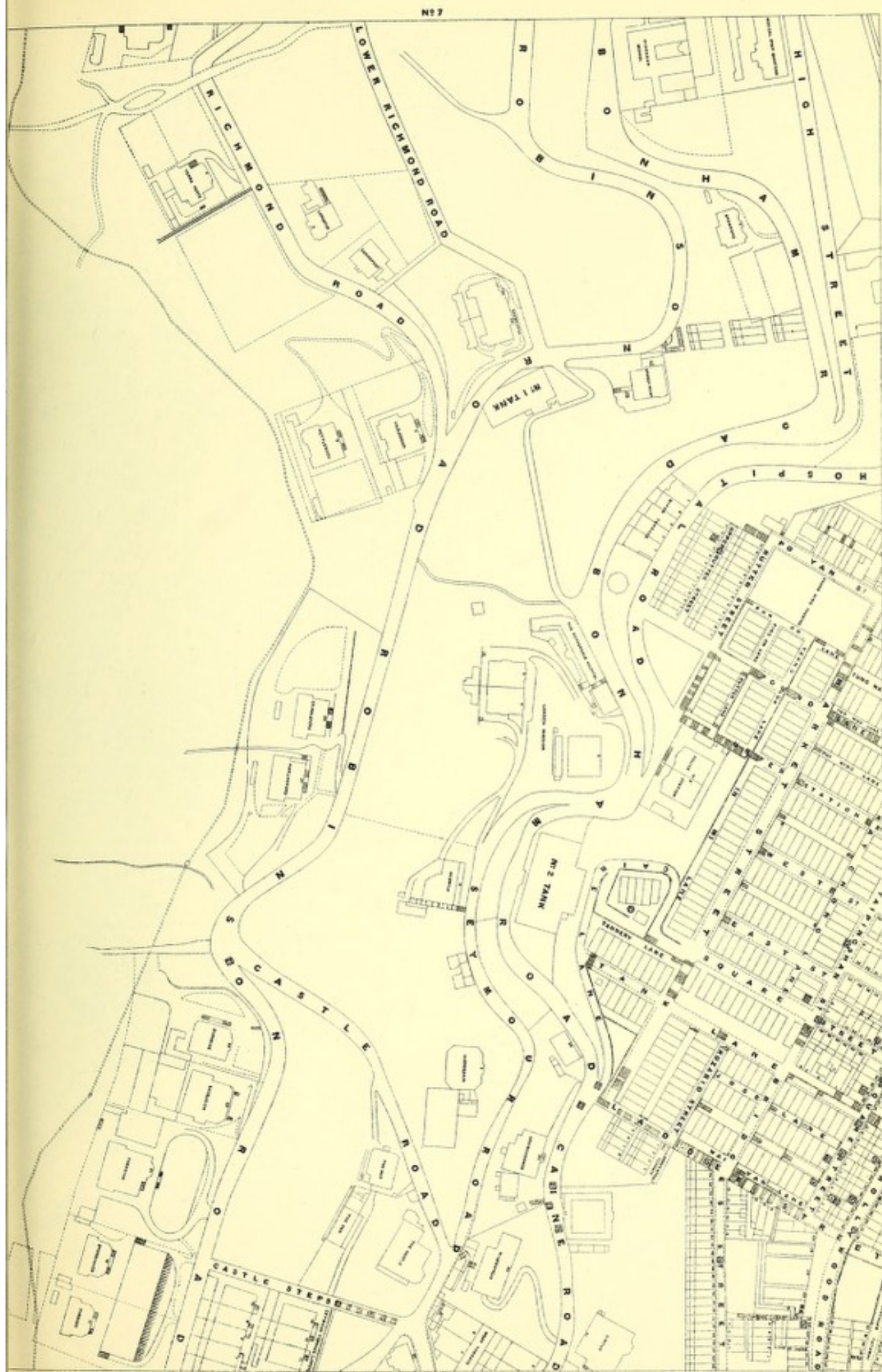
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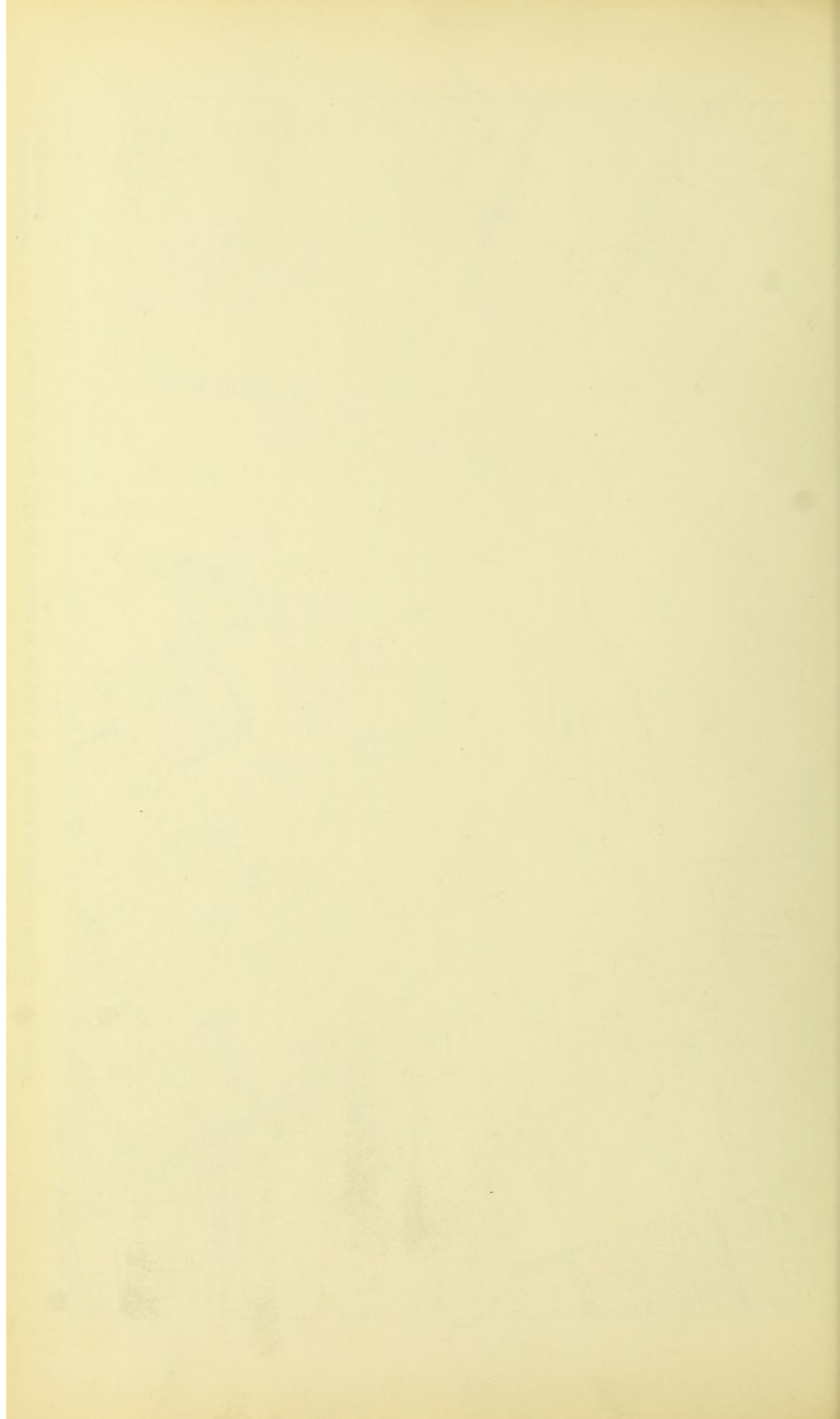




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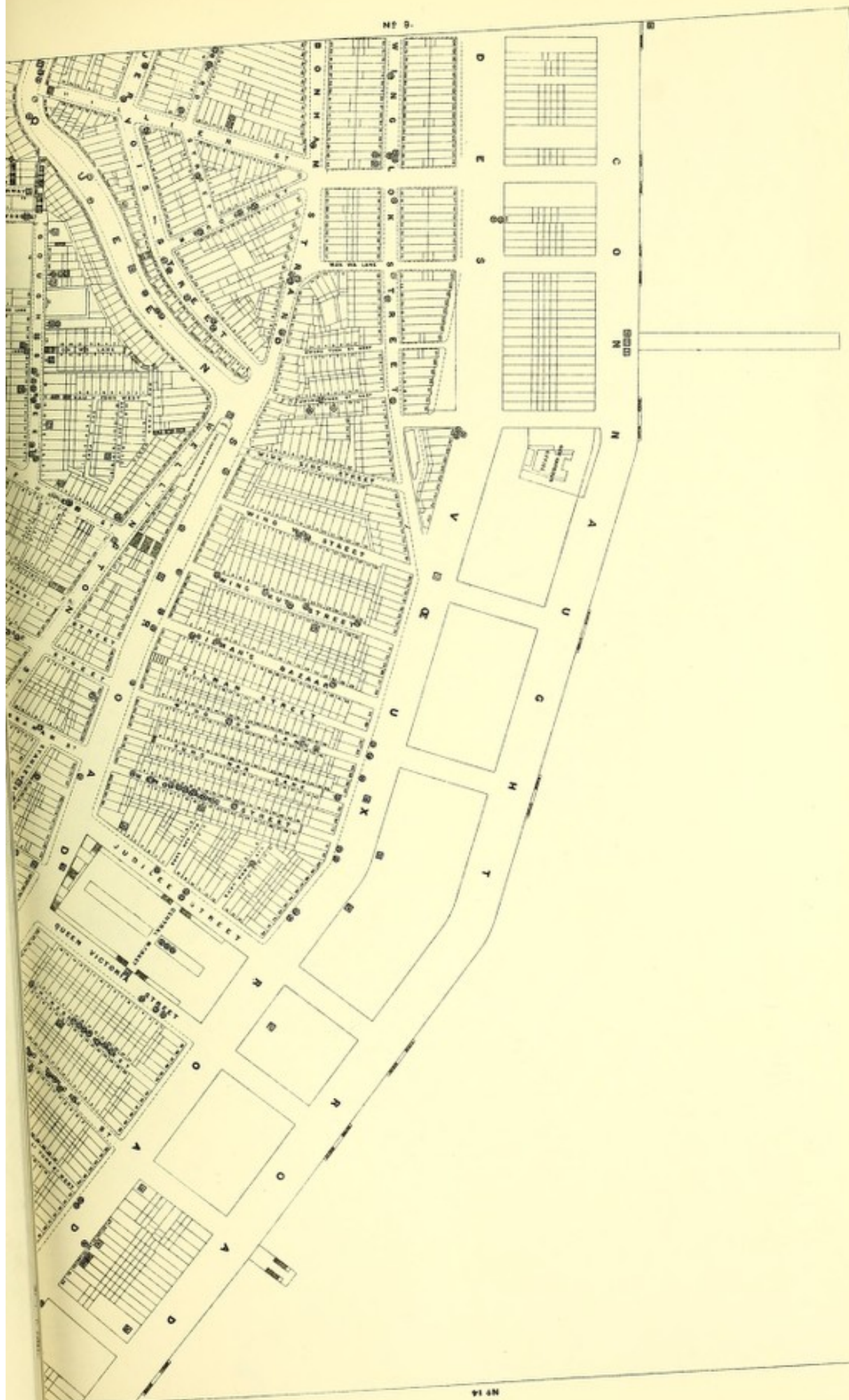


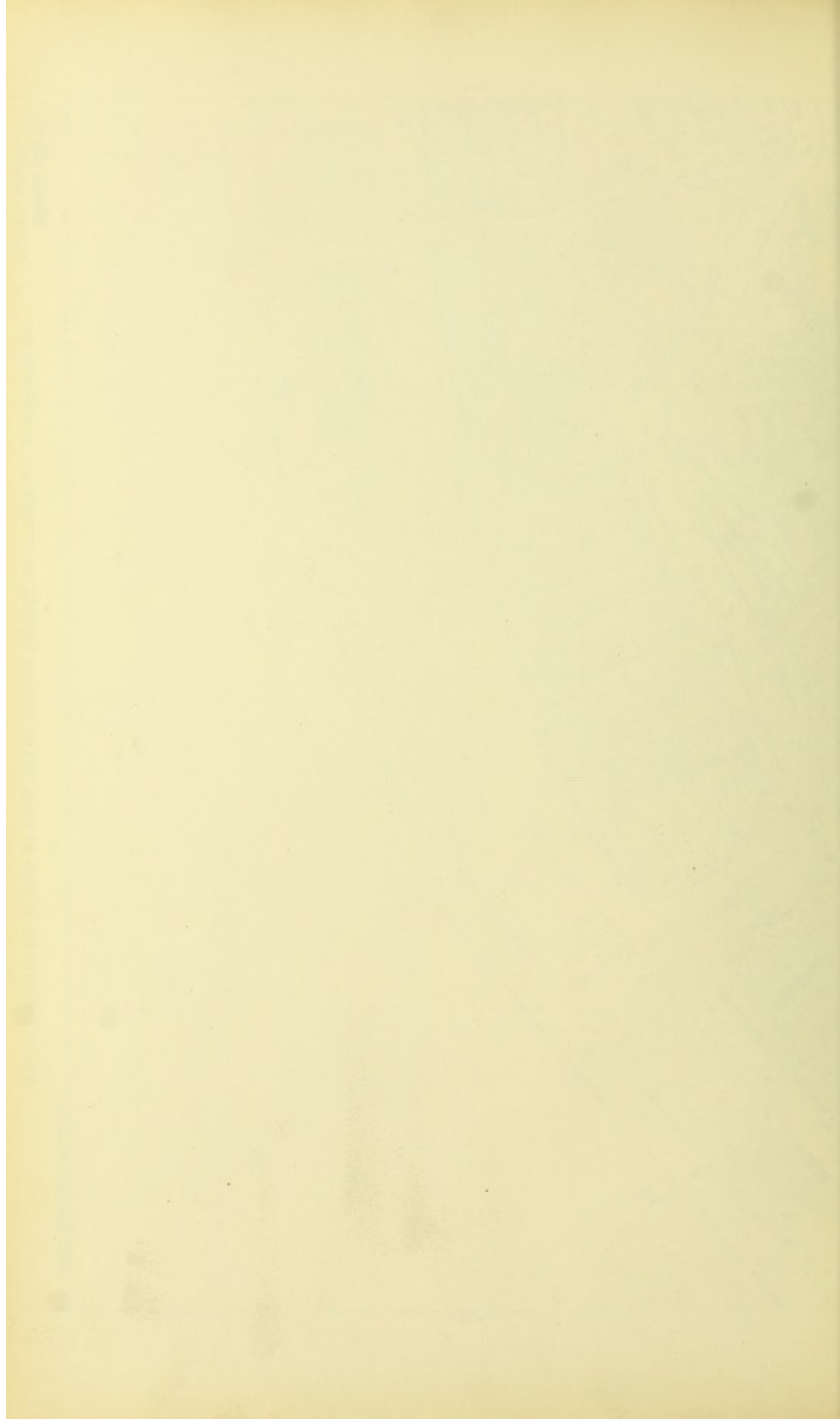


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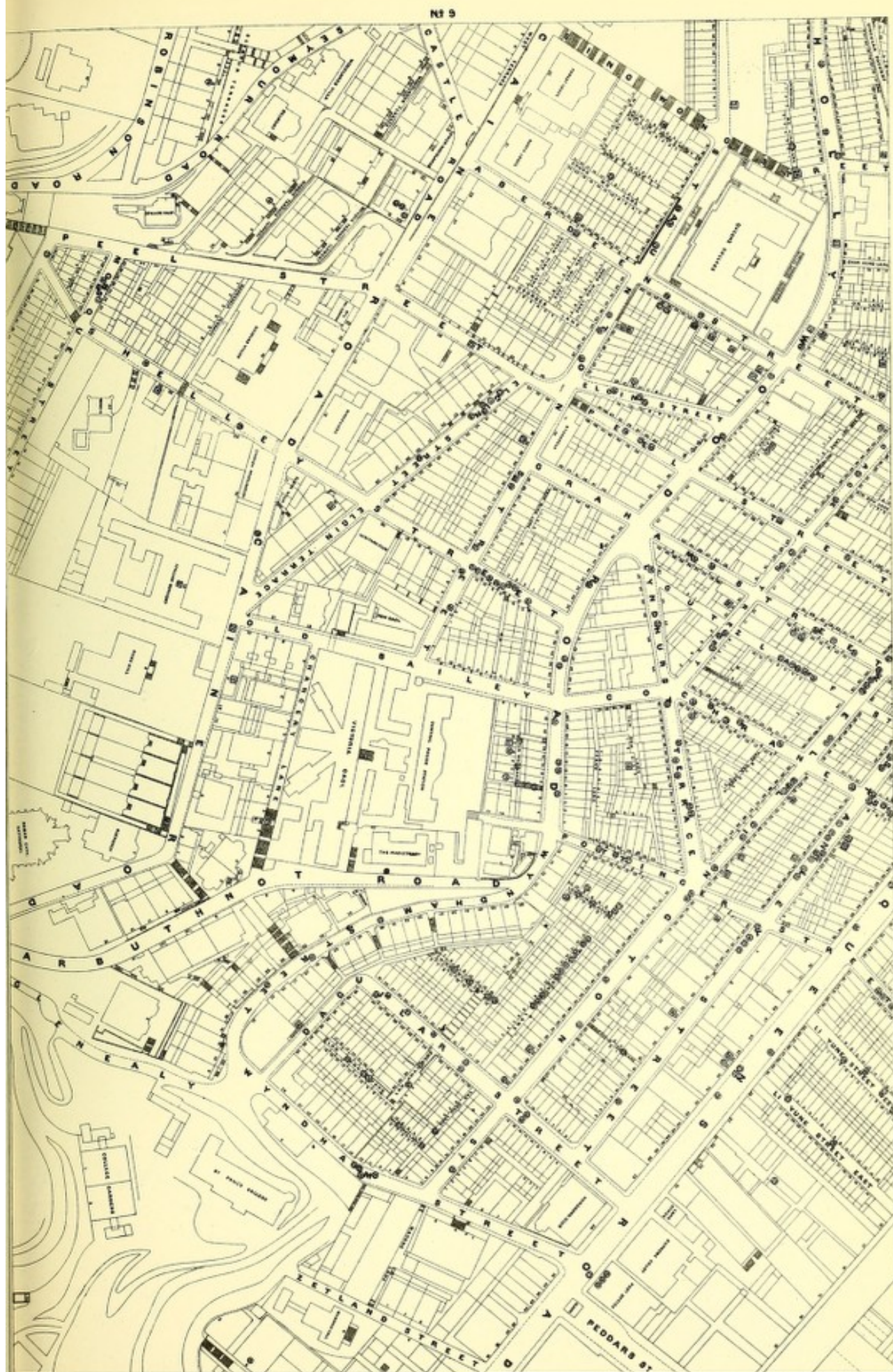


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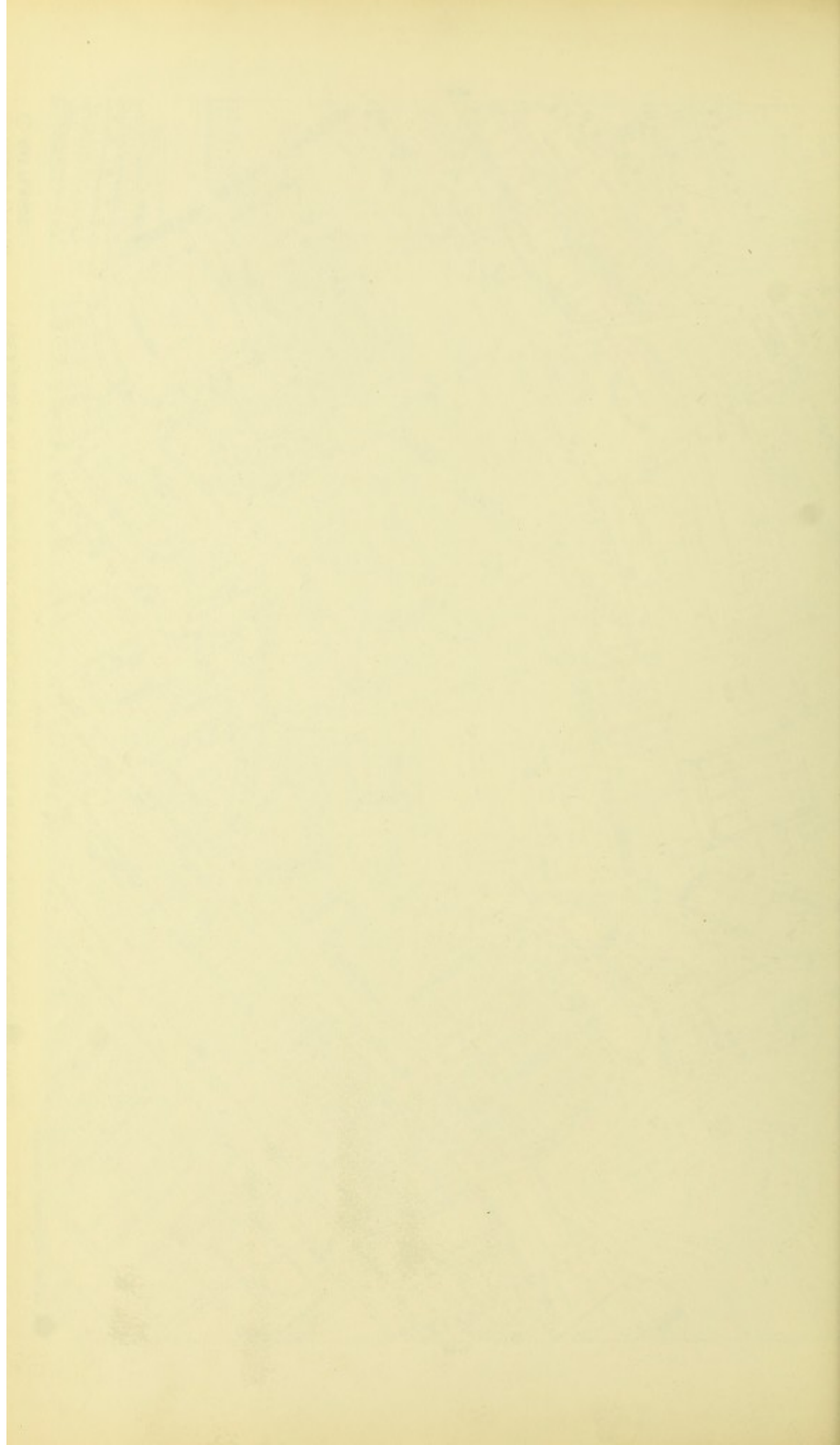
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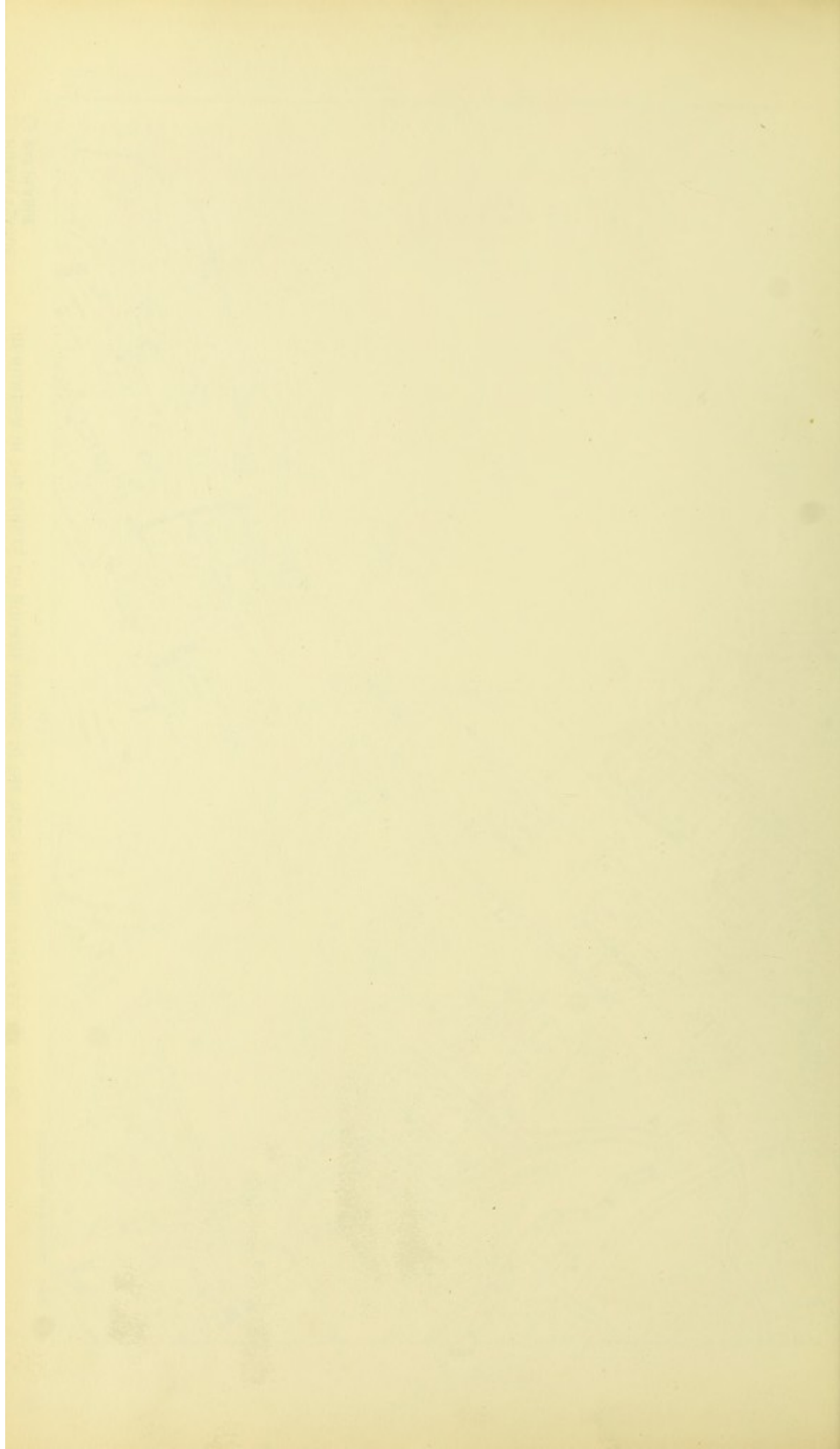
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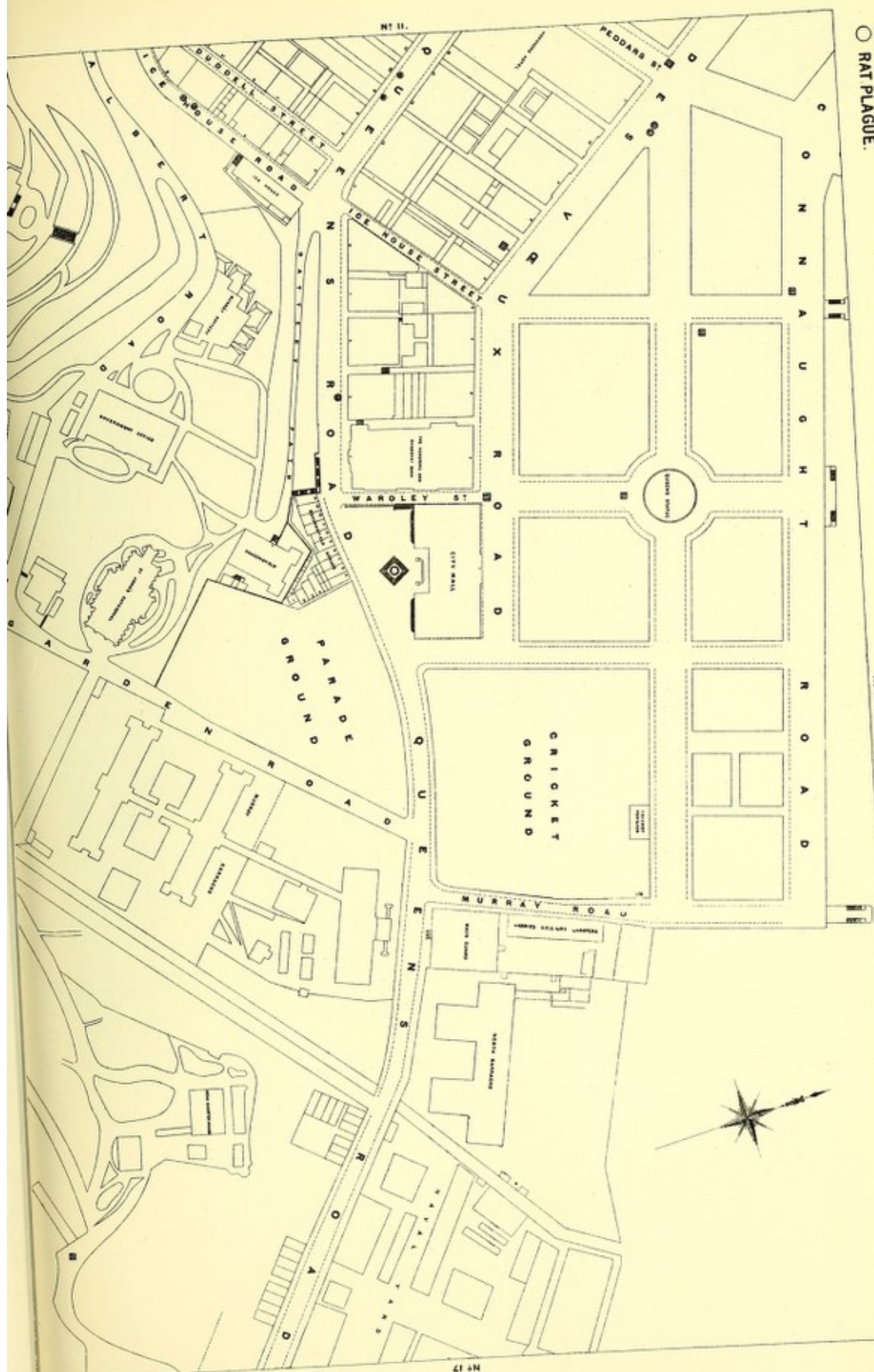


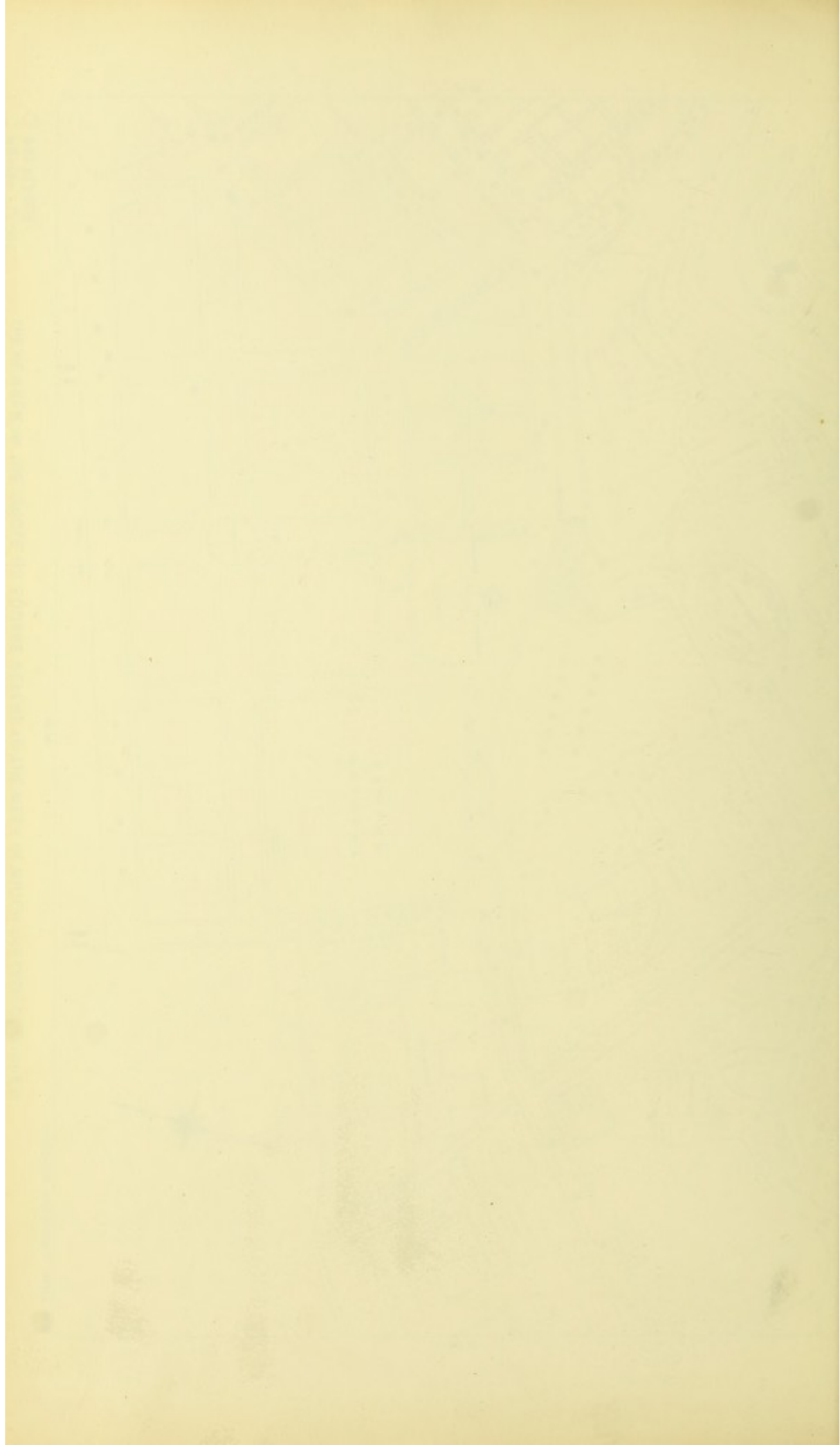
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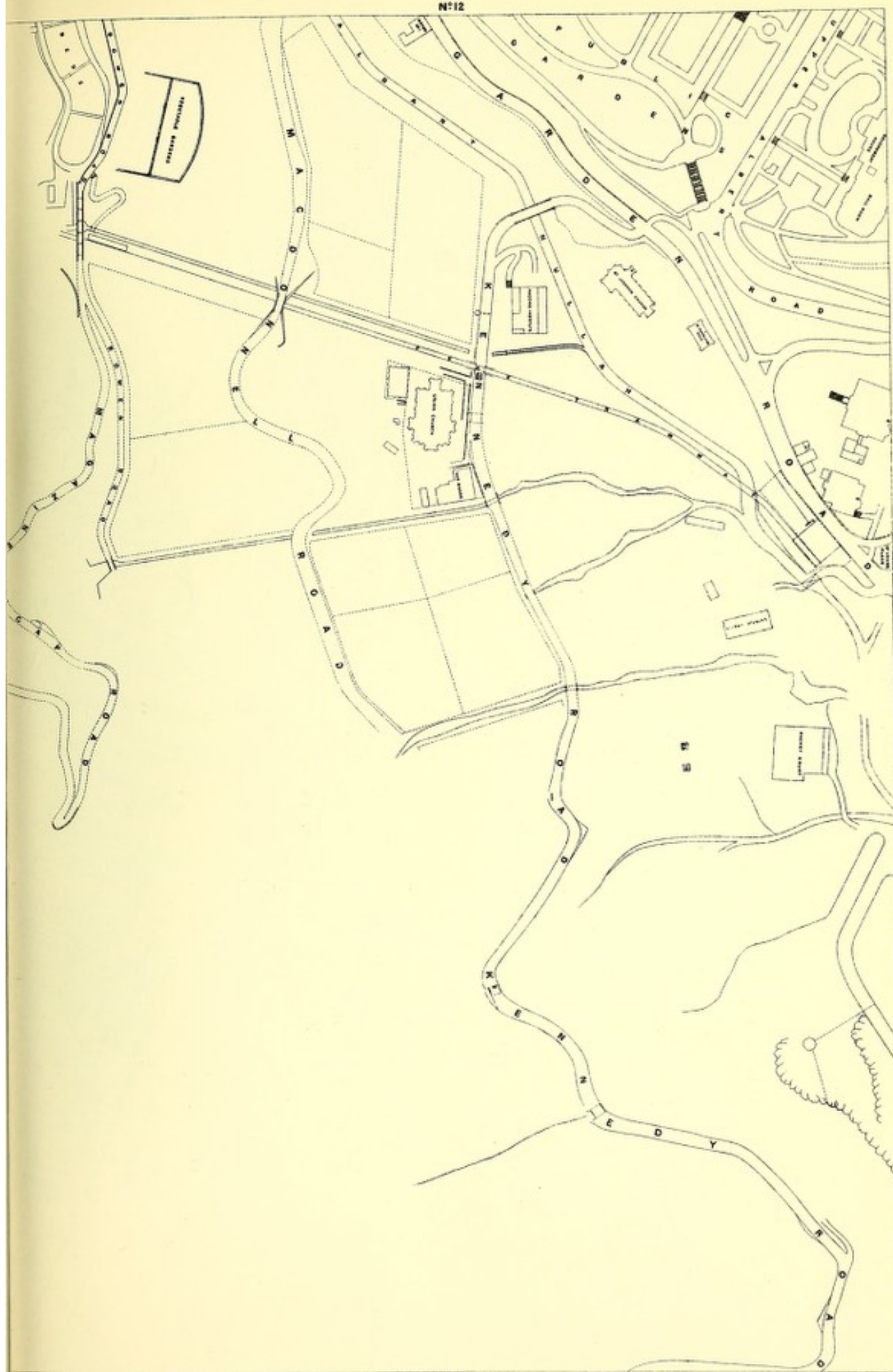


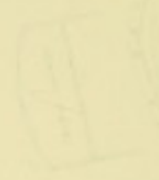


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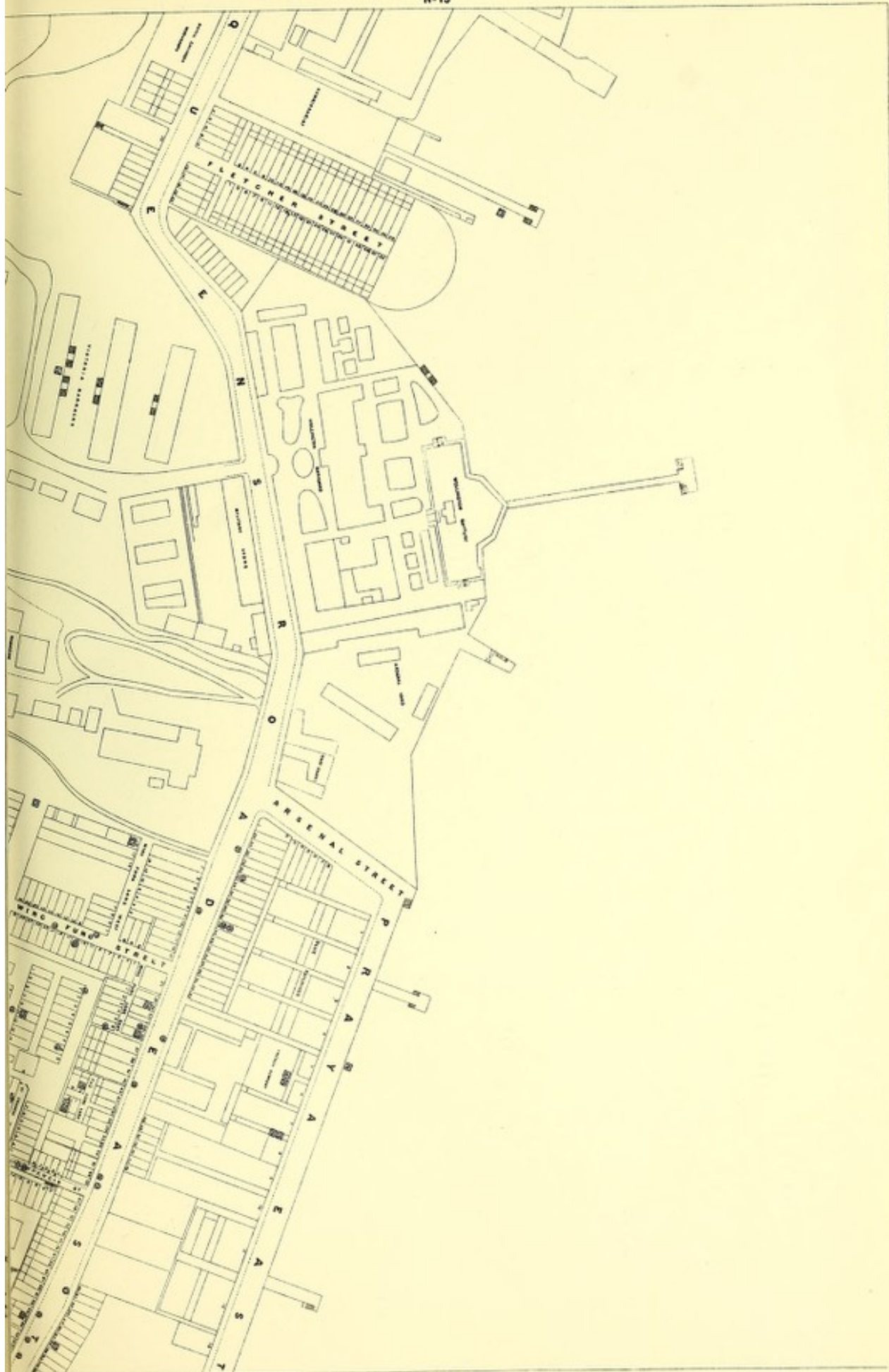


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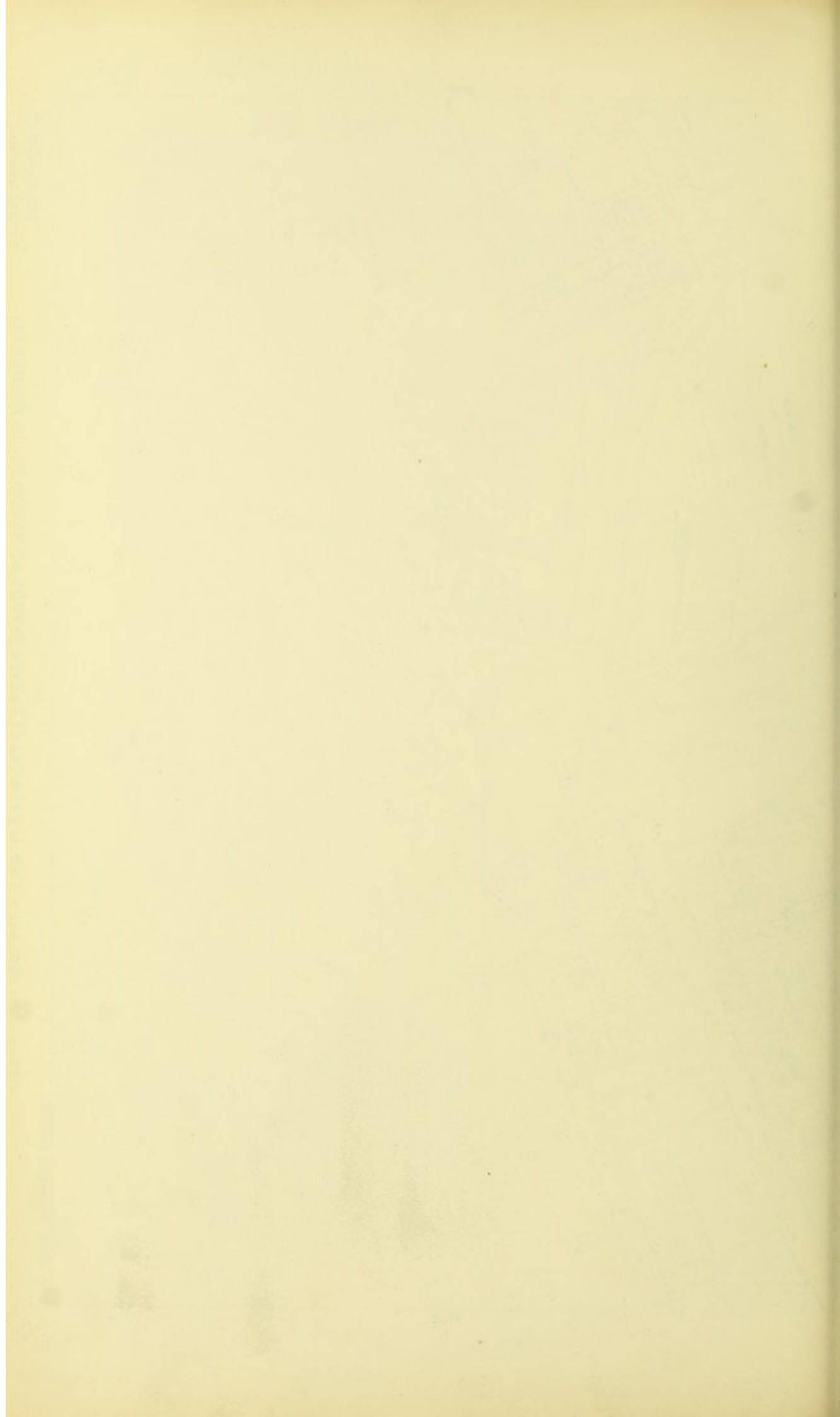
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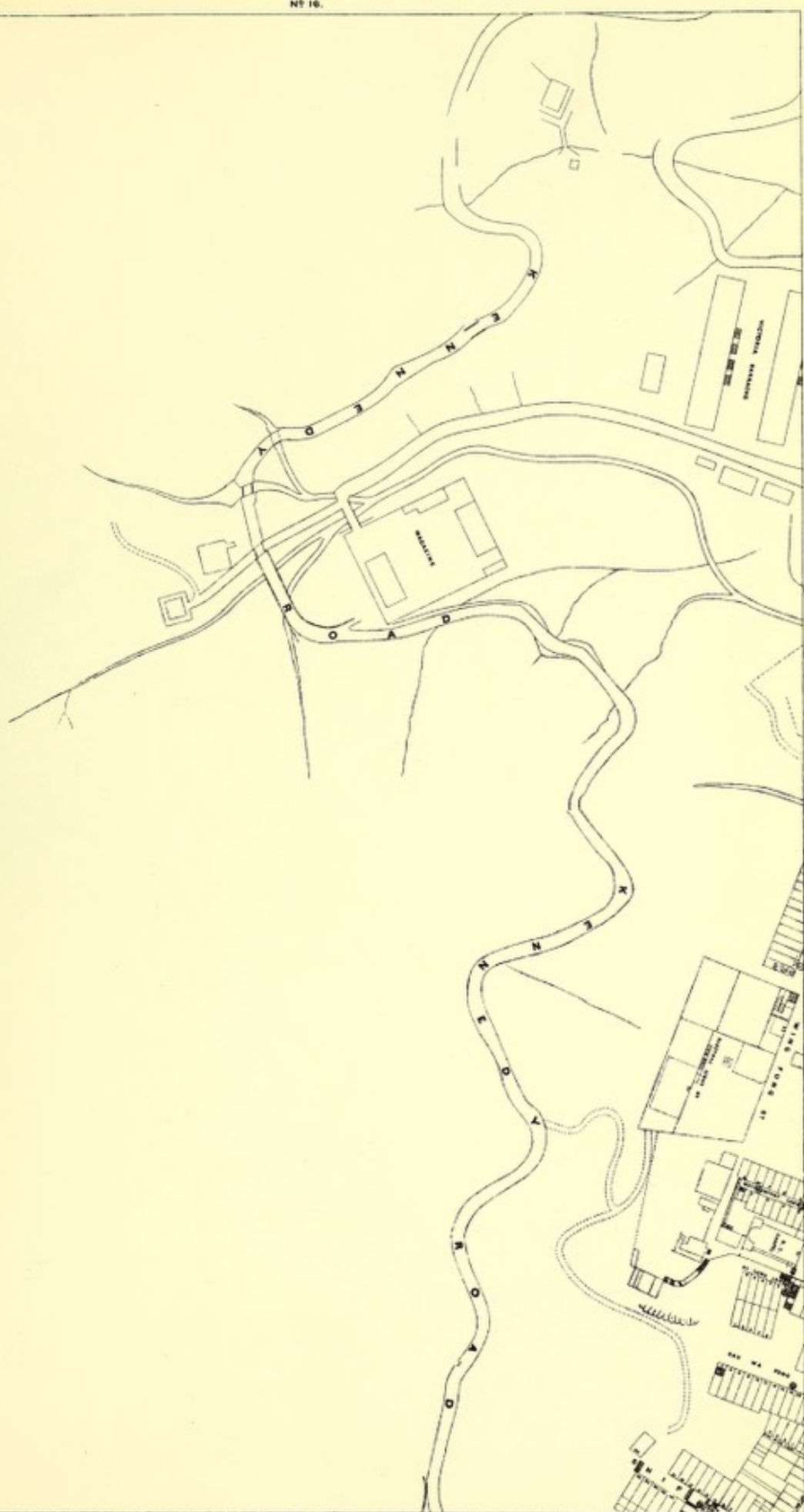


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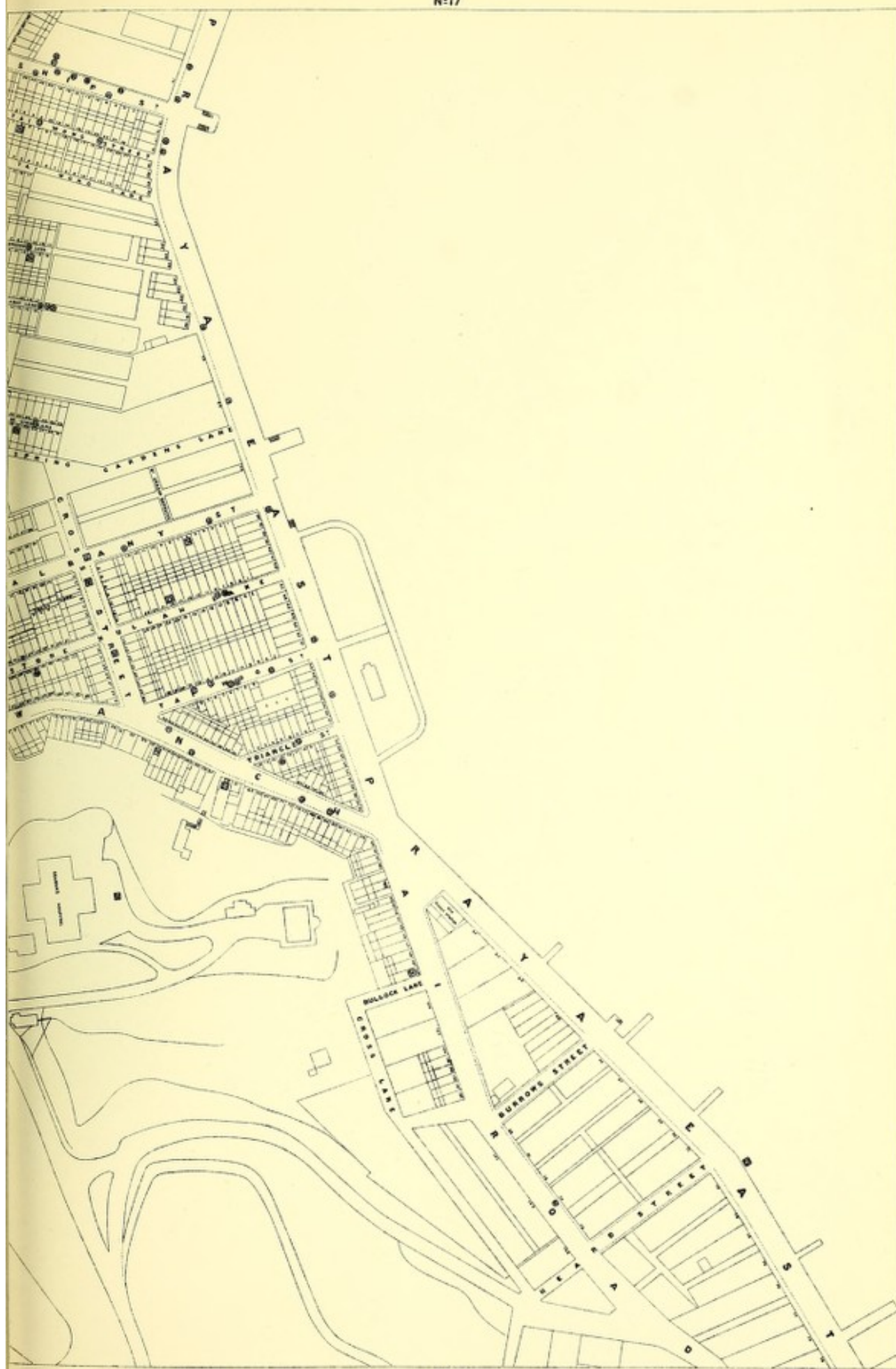
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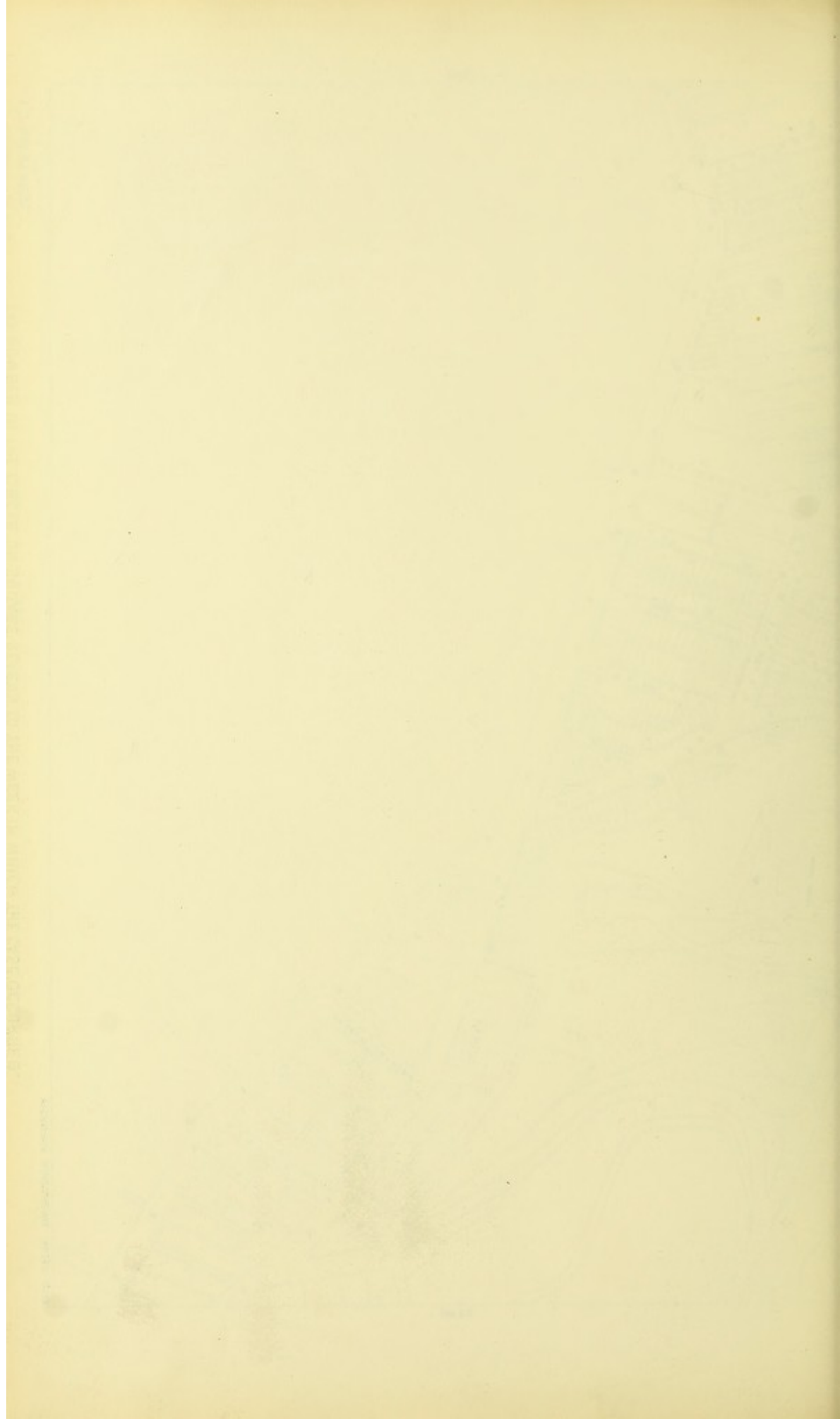
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□ HUMAN PLAGUE.
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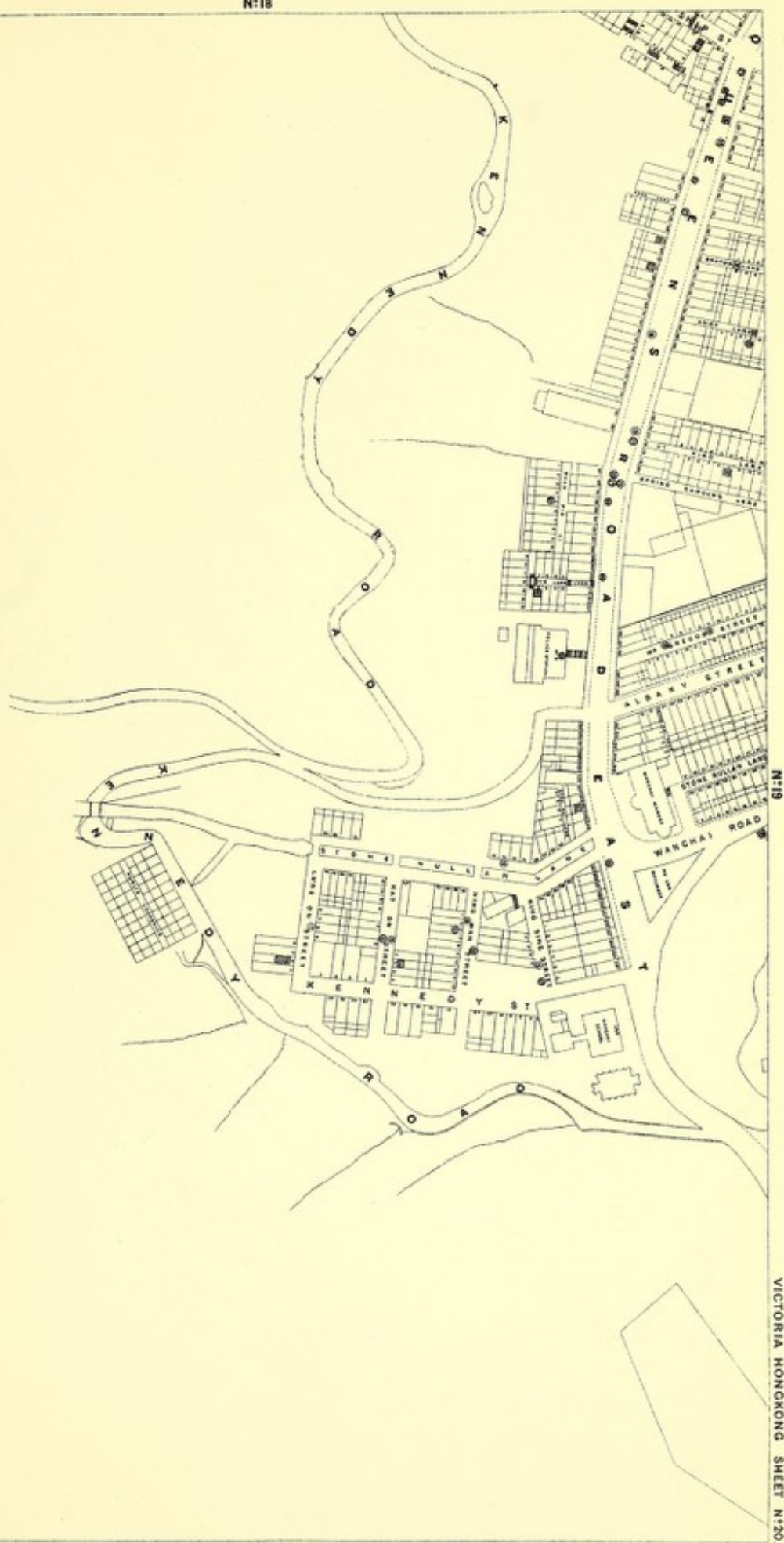
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○ RAT PLAGUE.

THE NUMBER IN THE CIRCLE OR SQUARE REFERS TO THE WEEK IN WHICH THE CASE OCCURRED.



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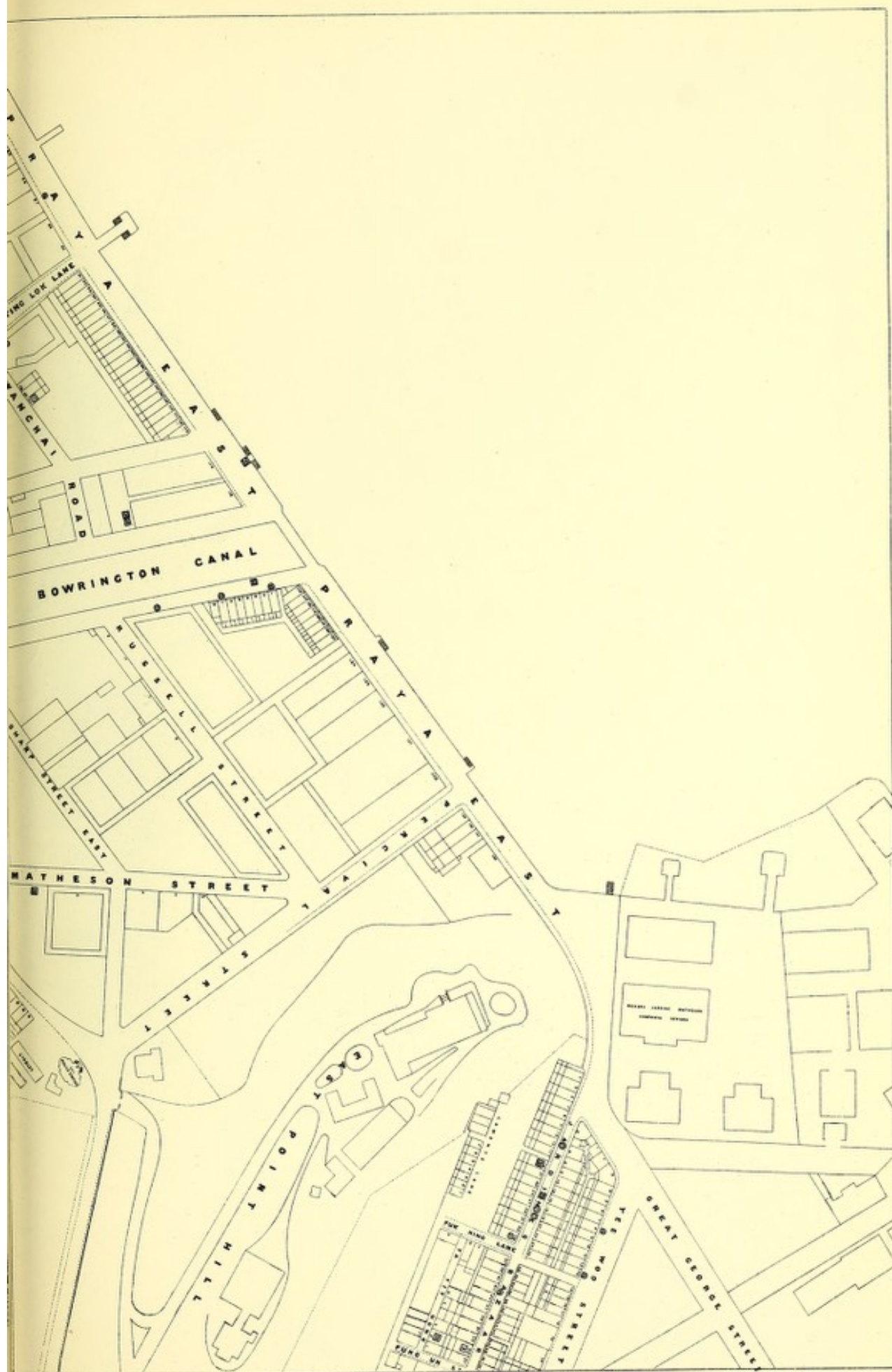
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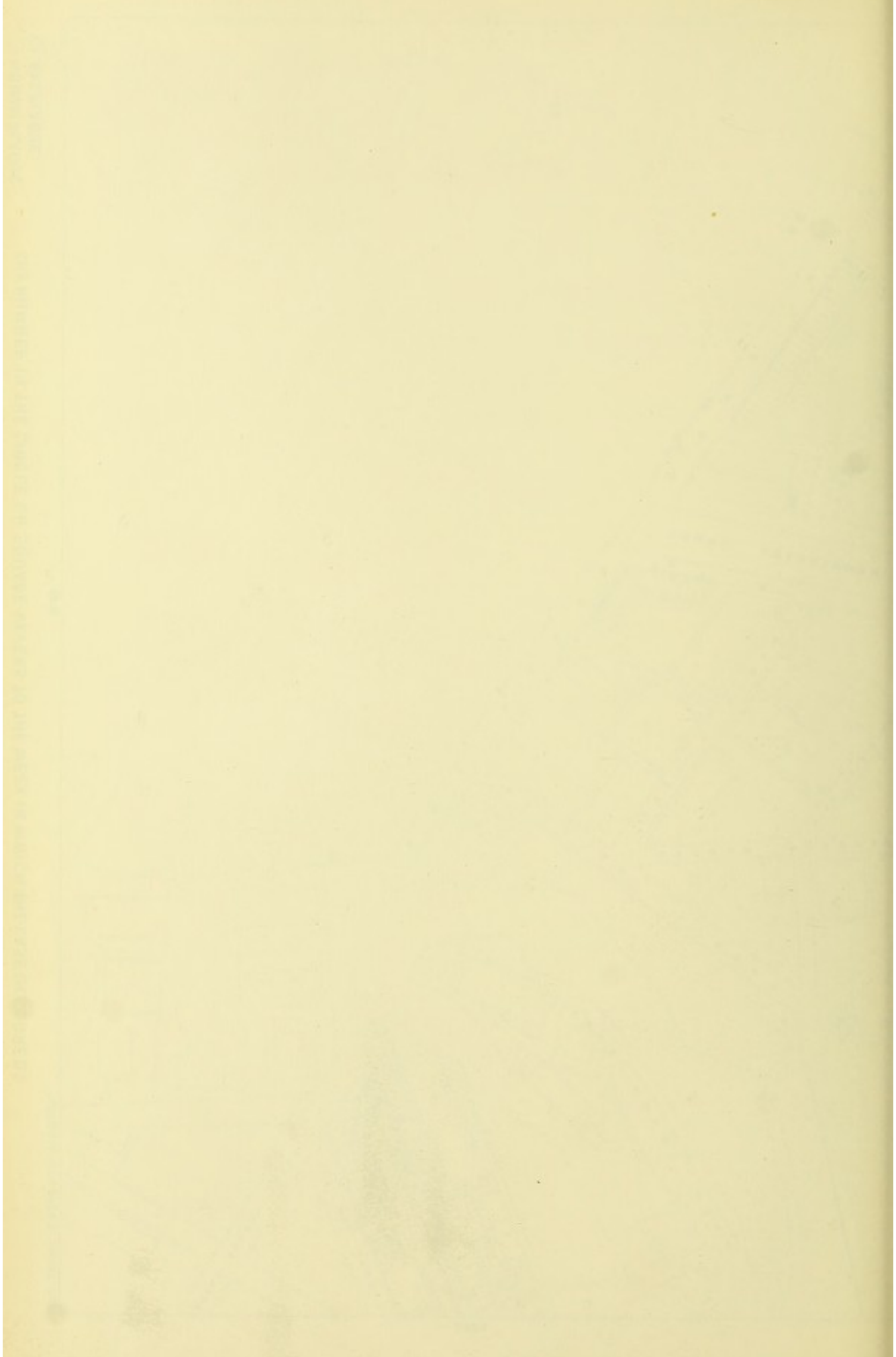
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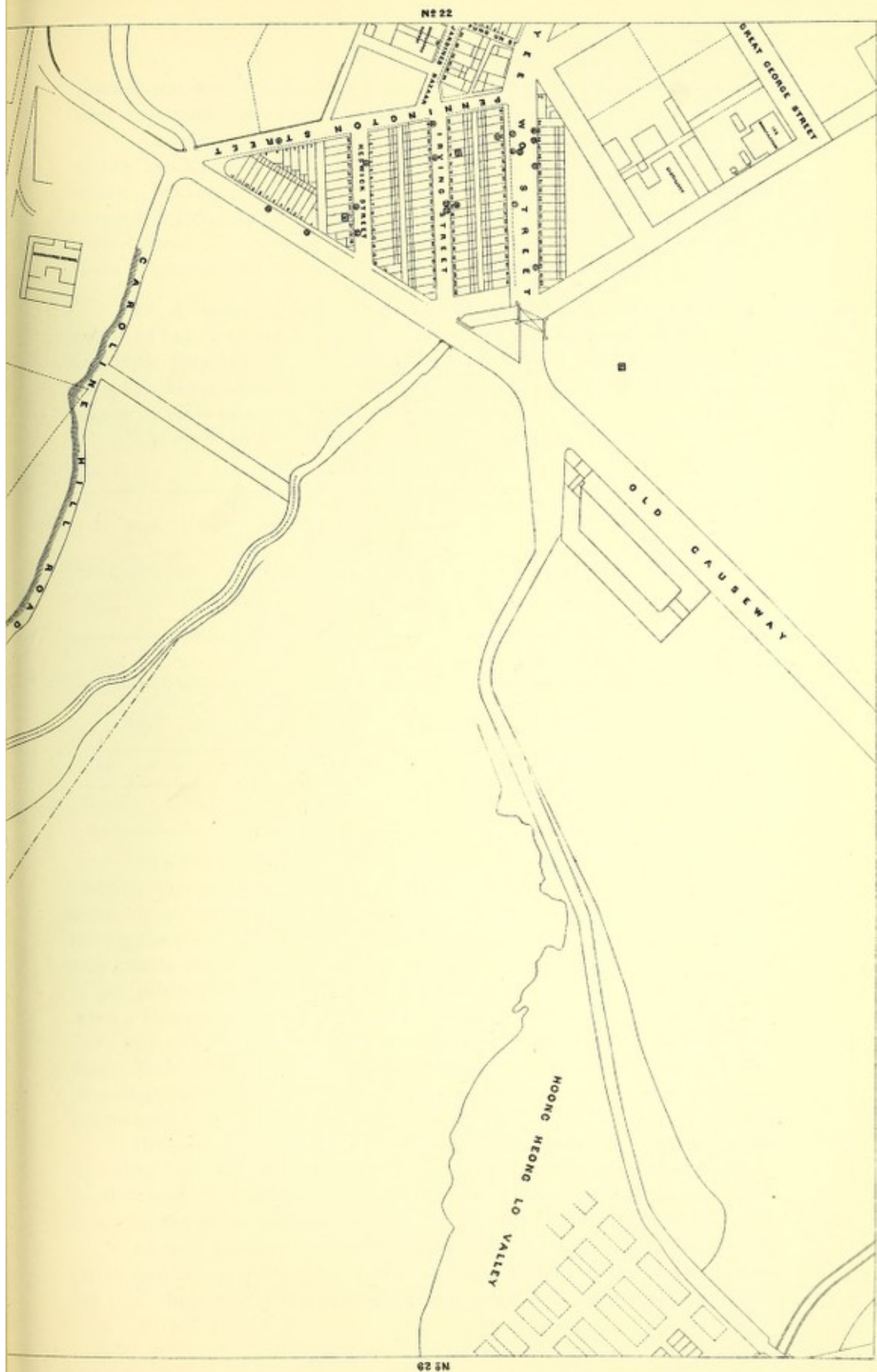
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THE NUMBER IN THE CIRCLE OR SQUARE REFERS TO THE WEEK IN WHICH THE CASE OCCURRED.

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Infected rats were found in the 18th, 19th, and 20th weeks, and plague cases were discovered in the 20th, 21st, 22nd, 23rd, and 24th weeks.

An opposite policy to that of prompt cleansing and evacuation was tried in this locality, with a very obvious spread of the disease traceable to this centre. Similar relationships of rat plague and human plague were repeatedly observed in different parts of the town, as seen in a careful examination of the several plans. In cleansing houses on account of plague having occurred in them, plague-infected rats were found in them in a few instances.

12. A number of rats bacteriologically examined in May and June was subjected to a more minute examination for bacilli than was necessitated for diagnostic purposes. The object was to ascertain the relative frequency that the spleen, blood, lungs, intestinal contents, urine, and mucus of mouth contained plague bacilli in plague-infected rats.

The result was as follows:—

HONGKONG, 1902.

Month.	Number of Infected Rats.	Blood.	Spleen.	Lang.	Intestinal Contents.	Urine from Bladder.	Mucus of Mouth.
May, after 19th.	151	100.0 %	92.0 %	38.4 %	28.4 %	16.5 %	17.2 %
June	216	100.0 %	94.8 %	55.0 %	31.0 %	16.2 %	22.2 %

KOWLOON, 1902.

Month.	Number of Infected Rats.	Blood.	Spleen.	Lang.	Intestinal Contents.	Urine from Bladder.	Mucus of Mouth.
May	69	100.0 %	91.1 %	46.3 %	33.3 %	13.0 %	15.9 %
June	118	100.0 %	94.9 %	70.3 %	39.7 %	19.4 %	33.9 %

As a factor in the dissemination of the infection while the rat is alive, probably the presence of plague bacilli in the intestinal contents, urine, and mucus of the mouth is the most important. It will be observed that, even in the highest percentage, plague bacilli were found in the intestinal contents in only a little over a third of the infected rats, in the urine in less than one-fifth of the infected rats, and in the mucus of the mouth in about one-third of the cases. This may account for the absence of plague at times in a house, though there may be infected rats, for the chances of contamination of food and other things likely to infect man are not as great as they probably would be if the intestinal contents, urine, and mucus of the mouth of every plague rat contained plague bacilli.

It was also observed that the rat plague appeared often where plague had been the previous year, for example, in one locality which had fifty-five houses attacked with plague in 1901, in eleven instances plague rats were found in 1902 either next door or opposite the house previously affected.

As large numbers of persons became affected the precedence of the rat plague became less marked, for the human cases of plague in their turn infected the rats, which, as shown in another section of this report, are very susceptible

to plague if they eat infected food. There were many cases of rat plague without any subsequent human plague. As soon as a case of rat plague came to the notice of the Medical Officer of Health, and every case was reported to him daily, prompt action was taken by him to prevent, if possible, the disease extending to human beings. The policy was to deal with rat plague and prevent human plague, instead of waiting for human plague and then taking action. This policy, combined with other measures, appears to have been successful, for in 1902 there were only half the number of cases of plague that have occurred in the best years and less than a third of the cases recorded in the worst years. With a thorough and more systematic bacteriological examination of rats in both Victoria and Kowloon, and prompt action on the intelligence thus acquired in the infected locality, even better results may be expected, notwithstanding the very serious handicap placed on success by the extremely insanitary condition of the interior of the Chinese houses in Hongkong. In cleansing blocks of buildings in June on account of plague-infected premises in the block, no fewer than 17 per cent. of the houses so cleansed were found to contain plague-infected rats, and 7 per cent. of the rats caught by the cleansers were infected.

Other facts bearing on the relation of rat plague to human plague.

13. Some instructive facts may be added on this subject. In 1901 thirty men were employed in Hongkong to collect rats, and no fewer than nine, or 30 per cent., died of plague, three others leaving the Colony sick. In 1902, 172 men were employed on the same business, but they were previously inoculated with Haffkine's prophylactic, made to wear shoes and take a bath after their duties before meals. Not a single one of them was attacked with plague.

In a private firm, of thirty coolies employed in sorting, and one of whose duties was to collect dead rats from the godown when required, five, or 16·6 per cent., contracted plague and died.

In another firm rats were dying in the store-room, and two men engaged in removing them were attacked with and died of plague. In the case of a firm where in 1901 three Europeans and two Chinese were attacked, the evidence points to a preceding invasion of infected rats.

In Canton it was observed that at the Shamien, which is the European settlement, the inhabitants and their Chinese servants remained free of plague though only separated from the infected quarters of Canton by a canal. It was also observed that the rats on the Shamien enjoyed the same immunity, though they were dying by thousands in the native part of Canton. In other towns also exposed to infection it was observed that when the inhabitants remained free of the disease the rats also shared that freedom. A similar immunity among rats and human beings was observed among the boat population in Canton and has also been observed in other parts of China. It was observed this year in Hongkong that the rat plague would pass along a number of houses on one side of the street and then suddenly pass over to the other side. A similar phenomenon has been observed in different epidemics of plague in human beings, and in the first phenomenon is to be found the explanation of the second.

The following is an instance of rat plague and human plague on board ship :—

The P. & O. S.S. "Ballarat" arrived in Hongkong from Bombay on the evening of February 16th, 1902, and started for Shanghai on the following afternoon. It arrived at Woosung, the port for Shanghai, on February 20th, and by the 22nd had had two deaths from plague on board. These were at first attributed to Hongkong, but the history of the ship points to another cause. The "Ballarat" had lain for thirty-seven days in Bombay, over a fortnight being in the dock and the rest of the time alongside the quay. Between Singapore and Hongkong the storekeeper discovered some dead rats in the store-room, and one night the doctor woke up and found a rat in his bed. Shortly after he complained of pain in his leg, which he attributed to a mosquito bite. On the 17th day of February, the day the ship was in Hongkong, he went on shore, but returned and went to bed feeling ill, and at the same time with his leg painful and swollen in the popliteal region. The swelling went on to suppuration and was opened at Shanghai. He was treated as a case of plague, Yersin's serum being given to him; and though he was a strong and athletic man, he was much reduced, and it was over three weeks before he could return to his duties.

Rat plague
and human
plague on
board ship.

On the 19th a Goanese scullion complained of illness and slightly swollen groin glands. He was isolated, but the next day he was found dead in bed. On the 21st a Goanese Topaz complained of feeling ill, but there was no fever and no enlargement of glands, but the next day he died suddenly. The Health Officer ordered the disinfection of the fore part of the ship, but previous to carrying out the order, on the 23rd, it was thought advisable to remove the stores, especially those liable to spoil, from the store-room, and as the stewards lived on the same floor, with only a grating between it and their cabin, disinfection of their cabin would affect the store-room. In carrying out this work, a large number of dead rats collected together were come across, many of them in an advanced state of decomposition. A few of the rats were placed in sealed receptacles and sent to Dr. Stanley, the Medical Officer of Health for Shanghai, by Dr. Jackson, the acting Medical Officer of Health for the port. Most of them were in too advanced a state of decomposition for Dr. Stanley to give any definite opinion on them, but the more recently dead yielded the plague bacillus. The process of removing the stores was accordingly stopped, and the store-room fumigated with sulphur, and the whole of the crew's quarters as well. The fumigation lasted for twelve hours. In cleansing the vessel, 177 dead rats were counted. Most of these had not been killed by the sulphur, as they were found in an advanced state of decomposition. On the 27th of February, the cook for the native crew was found dead in the galley. This was also supposed to be plague, but no post-mortem was made.

Dr. Stanley found plague bacilli in the glands of the Goanese. Hongkong was placed in quarantine, in this instance, for something she was quite innocent of. At the time there was no plague in Hongkong, and the plague on board the "Ballarat" was evidently derived from Bombay, where some plague-infected rats had either been brought on the ship with the stores, or had passed on to the ship when it was lying alongside the dock or quay. This case emphasises the importance of the destruction of all rats on board ship before leaving an infected port if the ship has been lying alongside of the quay or dock. Another interesting case, but perhaps not quite so clear,

is the case of the "Coromandel." The following letter, written by the Captain, gives the details:—

"P. & O. 'COROMANDEL,'

"China Sea.

"1st January, 1902.

"To PROFESSOR SIMPSON.

"Dear Sir,—The 'Coromandel' left Bombay on April 11th, 1900, and arrived at Hongkong April 27th, with everybody on board in good health. We remained in port twenty-four hours alongside Kowloon Wharf. On April 28th, we proceeded to Shanghai, arriving there on May 1st, all well.

"No cases of plague were known at Shanghai, and during our stay of three weeks the crew were all well and healthy.

"On May 21st, at 8 p.m., B—— the head waiter (European) was taken suddenly ill with fever, temp. 104.5° and showed all symptoms of plague. At midnight, the second saloon steward was also taken ill with same symptoms as B——, their temperatures going over 105° . These men occupied the same cabin, and on having the cabin stripped I found two dead rats (just decomposing) under their bunk.

"The store-room, in which was stored rice from Bombay for use of native crew, was also cleared, when many dead rats were found between and under the wooden gratings, having died while eating the rice.

"On arrival at Hongkong, where plague was very bad, these two cases were landed, the ship kept in quarantine for twenty-four hours and fumigated. Forty-eight hours after arriving, and twenty-four hours after coming out of quarantine, a Lascar sailor native was seized with plague and died in hospital. The day after leaving port, another Lascar was taken ill and died suddenly of swellings, &c., but it is doubtful whether it was plague.

"The two Europeans recovered after five weeks in hospital. No other case happened after, and everybody enjoyed good health.

"B——, I heard, visited a Japanese house of ill-fame at Hongkong, on afternoon of 27th, where three of the women died of plague shortly after his visit.

"I remain, &c.,

"J. W. VIBERT.

"Comdr. P. & O. 'COROMANDEL.'"

The long period of incubation, viz., twenty-four days, excludes the possibility of the head-waiter having contracted the disease in Hongkong from the Japanese prostitutes. There was no plague in Shanghai. The history points rather to something having been taken on board from Hongkong, and it is not unlikely that while the ship was lying at the wharf in Kowloon some infected rats from the shore got on to the ship, plague being prevalent in Kowloon at the time.

In connection with the illness of the first Lascar, it was discovered that while the store-room was being cleared he had stolen some of the rice, and it was thought that this was the cause of his attack of plague.

14. The dissemination of plague by the infected rat is, it appears, as marked in Hongkong as it was in Capetown, in South Africa, and the occurrence of rat plague on board ship antecedent to human plague is an additional link in the chain of evidence of the important rôle which rat plague plays in the spread of human plague.

PART III.

PLAGUE IN ANIMALS OTHER THAN RATS.

1. In many reports from China in connection with plague, mention is made of pigs, oxen, buffaloes, and chickens dying either before or at the time of a plague epidemic. The Chinese believe these deaths to be due to plague. To clear up this point, a question was asked with reference to it in the circular letter to medical men; and the answers, in a number of instances, confirmed the mortality among pigs, oxen, and chickens, but as to whether it was actually due to plague no one was in a position to give a positive opinion. No evidence, positive or negative, being obtainable in this direction, and no opportunity of examining the affected animals and fowls in China arising, it was necessary to settle the question of susceptibility to plague on other lines, and it was decided to do so experimentally. Was it possible or impossible to cause plague in chickens, pigs, and cattle by feeding or by inoculation with infected material derived from human plague?

General observations in China have led to the belief that pigs, oxen, buffaloes, and chickens die of plague.

2. In connection with experimental work of this kind it is to be noted that Staff Surgeon Wilm, of the Imperial German Navy, records, in his report on the epidemic of bubonic plague at Hongkong, in the year 1896, the following observations:—

Wilm's experiments and observations.

“A monkey that chewed and sucked a piece of sugar-cane infected by a pure culture of the bacillus died in five days of the disease. The post-mortem examination showed very slight swelling of the inguinal glands, great congestion of the intestine, and swelling of the mesenteric glands and of the spleen.

“A pig ate the spleen of a man that had died of plague; the animal lost flesh rapidly, suffered from diarrhoea, and died of plague in twenty-two days. The post-mortem examination showed hæmorrhages in the abdominal walls, the inguinal glands were swollen to the size of a hazel nut and bluish red in colour, the sub-maxillary glands were swollen to the size of a hazel-nut, the mesenteric glands were swollen to the size of a bean or hazel-nut and of a bluish colour; there were hæmorrhages in the mesentery, with much congestion and swelling of the stomach and intestinal walls, hæmorrhages in the mucous membrane, and swelling of the intestinal follicles; the spleen was enlarged, the kidneys were swollen and congested, and the lungs were engorged with blood. The plague bacillus was found in the interior of the organs, in the glands, and in the blood. Another pig, *inoculated subcutaneously* on the abdomen with a small fragment from a bubo, died of plague in forty days. The appearances on post-mortem examination were substantially the same as those just described. The site of inoculation showed moderate congestion and swelling.

“Two cats that ate portions of a bubo were ill for seven days, and became very thin, but recovered.

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"Fowls that swallowed fragments of organs and matter infected with pure cultures died as a rule after three or four days. Plague bacilli were found in the blood and organs.

"Pigeons were immune to subcutaneous inoculation."

And further :—

"In the beginning of August, 1896, on board of two steamships carrying pigs to Hongkong from the island of Hainan and from Pakhoi respectively, a large number of pigs died. A great many died also after they had been landed at Hongkong. Post-mortem examination of the bodies of these animals showed the same morbid appearances as in those killed by giving them plague-infected organs to eat, the appearances being most marked in the intestinal tract. A bacillus was cultivated from the blood and the intestinal glands, which was not to be distinguished from the plague bacillus found in man; it killed mice, rats, guinea-pigs, and rabbits when injected subcutaneously, and produced in these animals similar pathological changes to those produced by the plague bacillus. This observation is of importance for this reason, that the Chinese are extremely fond of pork, and breed pigs in very large numbers."

Further experiments required to settle the question.

3. These were very important experiments, but their paucity scarcely admitted of any generalisation on them without confirmation on a scale that would place the matter beyond dispute.

There was no need of experimenting on cats, because in the epidemic in Capetown it was proved by bacteriological examination, that cats and ferrets suffered from plague. Dr. Wilkinson, of Dailotei in North Formosa, mentions that during the plague epidemic there some cats were found by the Japanese laboratory officers to contain plague bacilli.

Mode of procedure.

4. For the purpose of the present research a sufficient number of pigs, calves, sheep, monkeys, hens, turkeys, geese, ducks, and a water buffalo were selected, and each was either inoculated or fed with plague material. As the investigation proceeded the inoculations were given up, because of the greater interest excited by the unexpected discovery of the readiness with which plague could be caused by feeding with plague material, a fact which has a new and important bearing on the manner in which plague spreads.

Rats and guinea-pigs were employed to further test and confirm the nature of the disease produced than was evidenced by finding plague bacilli in the animals and birds experimented on.

Cultures of plague bacilli on the usual media were not employed in this investigation, it being considered that plague material in its natural state, made into an emulsion with bouillon, would be nearer what occurs in nature than artificial cultures on agar-agar. The only occasions on which cultures were employed were for the inoculation of some guinea-pigs with bacilli isolated from the internal organs of a sheep, pig, and hen, in order to furnish additional evidence that the microbes so isolated were plague bacilli.

Cultures from the internal organs of some of the animals experimented on were made and examined, particularly from Calf No. 6, Sheep No. 4, Hen No. 7; Pigs No. 7 and No. 13, Monkey No. 4, and a goose and pigeon. The cultures corresponded to the characteristics of ordinary plague bacilli, while those

of Pig No. 13, Hen No. 7, and Sheep No. 4 inoculated into guinea-pigs caused their death in two and three days with plague bacilli in their blood.

The result of the experiments demonstrates that pigs, calves, sheep, monkeys, hens, pigeons, turkeys, geese, and ducks are more or less susceptible to plague of a fatal nature; that they take the infection by feeding as well as by inoculation; that the type of plague induced by feeding is usually septicæmic, and that the intestinal and urinary tracts contain plague bacilli.

5. The following is a brief summary of the experiments, greater details being entered into later when dealing with each animal.

Summary of
experiments
on pigs.

Pigs.

Nine experiments were made on fifteen pigs. Of the nine experiments, five consisted in feeding nine pigs with plague material. Two were subcutaneous injection of plague material into two pigs. Two were scarification of the skin of four pigs, and rubbing on to the scarified skin plague material.

Summary.

Of the nine pigs fed—

(a.) *Three were fed on material derived from plague cases.*

The three died of plague on the 36th, 30th, and 28th day respectively after feeding. They had a rise of temperature on the 14th to the 15th day, but beyond this they remained apparently quite well, with no diarrhoea, until a day or two before death, when they appeared to be somewhat feeble on their legs and inclined to stagger. The post-mortem appearances showed congestion of the organs, congestion and hæmorrhagic condition of most of the lymphatic glands, especially of the throat and neck in two out of the three cases, and patchy inflammation and hæmorrhages into the mucous membrane of the large intestines. Plague bacilli were present in the blood, spleen, glands, kidneys, bladder, and intestinal contents.

(b.) *Three were fed with organs and blood of pigs that had died of plague induced in them by inoculation and feeding.*

One of the three died on the 4th day after feeding, one on the 8th day, and one on the 17th day. High temperature appeared in one on the 3rd day, in another on the 4th day, and in another on the 9th day. There was no diarrhoea, but one or two days before death the pigs seemed to be feeble on hind legs. The glands of the body were congested, but varied very much in their degree of congestion and hæmorrhagic state. The large intestines were congested and hæmorrhagic. Plague bacilli were present in blood, spleen, and glands.

(c.) *Two were fed on organs and blood of a pig that had died of plague, induced by feeding it on the organs of a buffalo calf that had died of plague by inoculation with plague material.*

One pig died on the 4th day after feeding, the other died on the 13th day. The pig which died on the 4th day, though its organs swarmed with plague bacilli, can scarcely be counted as a death caused by plague alone, as it

EXPERIMENT
13.

EXPERIMENTS
& 27.

EXPERIMENT
54.

was evidently suffering from typical swine fever. The other presented similar post-mortem appearances to *a* and *b*, the lymphatic glands being congested and hæmorrhagic and the large intestine hæmorrhagic. Plague bacilli were present in both pigs in blood, spleen, and glands.

EXPERIMENT
59.

(*d.*) *One was fed with internal organs of a hen which had died of plague caused by feeding it with the organs of Pig No. 10.*

Pig was killed on the 13th day. In a week's time, the eyes became congested, and discharged white mucus in which plague bacilli were found. On the 12th day the urine was examined and found to contain plague bacilli. Pig became very weak about the 12th day. Post-mortem showed glands to be congested and hæmorrhagic, and large intestine inflamed in patches. Plague bacilli in spleen and glands of neck, but not in the blood.

EXPERIMENTS
12 & 15.

Both pigs were injected subcutaneously with plague material.

One pig died on the 4th day after injection. The glands of body were congested and hæmorrhagic. The internal organs of body were congested, but the mucous membrane of stomach, small intestines, and large intestines was healthy. Plague bacilli were present in the blood.

The other pig was killed on 35th day after inoculation. The seat of injection had necrosed and sloughed, but animal beyond this was apparently well. Post-mortem appearances seemed to indicate that animal was recovering. All the organs were very pale, but glands were enlarged and congested. No plague bacilli were present in blood, but a few were present in spleen, glands of neck, and in kidneys.

EXPERIMENT
26.

Of the four pigs scarified on the skin of abdomen and then vaccinated—

(*a.*) *Two pigs were vaccinated by rubbing the organs of Pig No. 7 (Exp. 21) on to the scarification.*

One pig died on the 9th day, the other on the 15th day. Temperature rose in both pigs on the 4th day. Post-mortem showed lungs to be pneumonic in patches, mucous membrane of stomach, small and large intestines healthy. Plague bacilli in organs, lungs, and glands.

EXPERIMENT
23.

(*b.*) *Two pigs were vaccinated by rubbing the organs of buffalo calf (Exp. 11) on to the scarifications.*

One pig died on the 9th day, the other on 19th day. Temperature rose in both pigs on 6th day. Both had congestion of eyes and unsteady gait before death; one suffered from diarrhoea. The pig that died on the 9th day showed at the post-mortem healthy intestines; that which died on the 19th day, and suffered from diarrhoea, showed inflamed large intestines and lungs with pneumonic patches. Plague bacilli present in the blood of both.

6.—CONCLUSIONS FROM EXPERIMENTS ON PIGS.

(1.) Pigs take plague by feeding, subcutaneous injection, or by scarification of the skin and vaccination with plague material.

(2.) The plague material may be from a human source, or from another animal such as a pig, a buffalo, or a fowl.

(3.) When plague is caused by feeding, the type is septicæmic, the parts chiefly affected are the lymphatic glands and the mucous membrane of the stomach and large intestines. Death may take place as early as the 4th day or be delayed over a month. Plague induced in this way from animal to animal is quicker than from a human source.

(4.) When plague is caused by subcutaneous injection or by scarification, the mucous membrane of the stomach and large intestines are seldom affected. In three out of the four pigs scarified there was patchy pneumonia.

(5.) With exception of high temperature, there is seldom any other symptom to show that the pig is ill with plague. There is occasionally congestion of eyes and discharge from them. During the last twenty-four hours or more there may be staggering gait. The only certain method of diagnosis is by post-mortem and microscopical examination.

CALVES.

7. Seven experiments were made on eight calves :—Of these, three were fed with plague material. Two were injected subcutaneously with plague material. One was injected intraperitoneally with plague material. Two were scarified on abdomen and the scarifications smeared with the plague material.

Summary of
experiments
on calves.

Of the three calves fed—

(a.) One was fed three times with plague material from a plague case, and died on the 24th day after first feeding, or the 22nd day after the second feeding, or the 20th day after the third feeding. The post-mortem showed infiltration of gelatinous material in floor of mouth, with cedematous swelling around; glands in region of neck enlarged, congested, and hæmorrhagic, crowded with plague bacilli. Few plague bacilli in blood and in spleen; intestines healthy.

(b.) One was fed twice with plague material from a plague case, and died on the 19th day after first feeding, and fifteen days after second feeding. mucoid or gelatinous swelling in floor of mouth. No marked congestion of organs. A few plague bacilli in blood and in lymphatic glands.

(c.) One was fed with blood from Calf No. 6 (Exp. 24), which had died by smearing scarifications on abdomen with plague material from gland of Buffalo calf No. 5 (Exp. 11), and died on the 9th day after feeding. The pharyngeal muscles were much congested and hæmorrhagic. The glands of neck, upper part of body, mesenteric and retro-peritoneal most affected. Plague bacilli in glands. Intestines normal.

Of the two injected subcutaneously—

(a.) One was injected twice with plague material from a plague case, and beyond an elevated temperature, enlarged and painful lymphatic glands, and loss of weight, showed no other signs of illness.

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EXPERIMENT 11. (b.) One water buffalo calf was injected twice with plague material from a plague case, and was in a comatose and dying condition on the 9th day after the first injection, or the 7th day after the second. The calf was killed. The inguinal, axillary, and crural glands were much enlarged and hæmorrhagic. Plague bacilli in enormous numbers in these glands; blood contained very few plague bacilli. Intestines normal.

EXPERIMENT 3. The one injected intraperitoneally with plague material from a plague case died in thirty-six hours. Iliac and popliteal glands congested. Plague bacilli.

Of the two calves scarified on abdomen, and scarifications smeared with plague material from Water Buffalo calf No. 5—

EXPERIMENT 24. (a.) One, nine months old, died on the 6th day. Large quantity of peritoneal fluid in abdomen containing plague bacilli. All the organs of the body deeply congested. Mucous membrane of intestines covered with hæmorrhagic patches. Glands enlarged, congested, and hæmorrhagic. Plague bacilli in blood and glands.

EXPERIMENT 24. (b.) One died on the 9th day. Glands congested, but not hæmorrhagic. Mucous membrane of large and small intestines inflamed. A few plague bacilli mixed with other organisms in blood, spleen, and glands.

The fact that plague affects cattle is important in the matter of raw hides, which at one time were supposed to carry plague.

HENS.

SUMMARY OF EXPERIMENTS ON HENS. 8. Twelve experiments were made on thirty-one hens. Of the twelve experiments eleven consisted in feeding twenty-nine hens with plague material. One consisted in subcutaneous injection of plague material into two hens.

Of the twenty-nine hens fed—

EXPERIMENTS 6, 7, & 64. Eight were fed with plague material derived from human plague cases. Of these three died, one on the 11th day, one on the 15th day, and the third on the 10th day.

EXPERIMENT 30. Six were fed with plague material derived from a hen dead of plague. Three were affected. The three died two days after feeding.

EXPERIMENT 44. Three were fed with plague material derived from a calf dead of plague; one of the three died in two days.

EXPERIMENT 58. Two were fed with material derived from a pig dead of plague; one died in two days.

EXPERIMENT 60. One was fed with material derived from rat dead of plague; died in two days.

EXPERIMENTS 49, 53, 66, 69. Nine were fed with plague material—three from monkey, four from pig, two from rat—with no results.

Two hens were injected with plague material from a human plague case. One died in two days, the other in fourteen days. All the hens that died had plague bacilli in their blood.

N.B.—The hens were kept in twos and threes in the same cages. Owing to the avidity with which some of the hens in each cage took the infected food it was not always certain as to the others getting any or more than a very small quantity.

OTHER BIRDS.

9. Nine experiments were made on various birds, twenty-eight in number. Of these, seven were pigeons, six were turkeys, six were geese, six were ducks, three were small redbeak birds.

Summary of
experiments
on other birds.

Of the seven pigeons—

(a.) Two were injected intramuscularly with 2 ccs. of a bouillon emulsion of pneumonic plague lung. Both died within twelve hours, plague bacilli being found in their blood.

(b.) Two in one cage were fed with the internal organs of hen No. 4 (Exp. 7), which had died of plague from feeding with an emulsion of a plague bubo. One pigeon died in twenty-four hours, and plague bacilli were found in blood and spleen. The second one remained well for sixteen days, was fed with glands of Pig No. 16, and died two days after with plague bacilli in blood and spleen.

(c.) Two in one cage were fed with organs of duck and pigeon which had died of plague. One pigeon died in less than thirty-six hours, the other pigeon in less than sixty hours. Plague bacilli were found in the blood of both.

(d.) One was fed with gland of Pig No. 16 (Exp. 74), which had died of plague from natural infection. Pigeon died on third day with plague bacilli in blood and spleen.

Of the six turkeys—

Six in one cage were fed with internal organs of Hen No. 4 and Hen No. 5. Hen No. 4 had died of plague from being fed with plague material from a plague case. Hen No. 5 had died of plague from intramuscular injection of plague material from a plague case. One turkey died three days after feeding, one turkey died seventeen days after first feeding, and fourteen days after second feeding. In both plague bacilli were in the blood.

The other four turkeys remained well during the period I was in Hong-kong. It should be stated that the six turkeys were in the same cage and that they were loath to eat the mixture given them. Only one was seen to take the food. Dr. Hunter writes since my departure that two other turkeys died of plague on the 40th and 47th day after the first feeding or on the 37th and 44th day after second feeding.

Of the six ducks—

(a.) Three in one cage were fed with plague material from a case of plague. One died on the 18th day with plague bacilli in blood and spleen.

The other two remained well, but subsequently I hear from Dr. Hunter, died of plague forty-seven and fifty-four days after feeding.

EXPERIMENT
37.

(b.) Three in one cage were fed with internal organs of Hen No. 4 (Exp. 7), which had died of plague from being fed with material from a plague case. One duck died in twenty-four hours, another in two and a-half days, and the third in seventeen days. All showed plague bacilli in blood and spleen.

Of the six geese—

EXPERIMENT
36.

(a.) Three in one cage were fed with a portion of a bubo from a plague case. One died on the 11th day with plague bacilli in blood and spleen. The other two remained well.

EXPERIMENT
38.

(b.) Three in one cage were fed with internal organs of Hen No. 4 (Exp. 7) and Hen No. 5 (Exp. 17). One goose died in seventy-two hours with plague bacilli in blood. The other two geese remained well, but one subsequently, I hear from Dr. Hunter, died of plague on the 38th day after first feeding, or on the 35th day after second feeding.

EXPERIMENT
70.

Of the three redbeaks—

Three in one cage were fed with gland of Calf No. 1, which had died from being fed with plague material from a plague case. Two redbeaks died on 4th day with plague bacilli in blood. One remained well.

Summary of
experiments
on monkeys.

10. Seven monkeys were experimented on in two series. In one series, *two* were inoculated with blood of rat which had died of plague; *one* was fed with a banana smeared with the blood of the same rat which had died of plague; and *one* had the same rat placed in its cage. All four took plague; the two inoculated died on the 6th and 7th day, the one fed died on the 6th day, and the one placed in contact with the dead rat died on the 10th day. The four monkeys in the first series showed symptoms of illness about the same time.

There was no difference in the post-mortem appearance of any of the cases, whether infected by inoculation, feeding, or contact with plague material, and they were all cases of septicæmic plague. The experiment demonstrates that rat plague is communicable to the higher animals.

The exact manner in which the monkey with the plague-infected rat in its cage became infected it is difficult to say. It may have been by self-inoculation caused by scratching, or by infection of the mouth, the fingers of the monkey becoming infected by touching the rat, or it may possibly have been due to fleas from the rat passing to the monkey, or the fleas of the monkey passing to the rat and then again settling on the monkey.

With the object of endeavouring to settle this point in the second series, two monkeys were placed in specially constructed cages along with rats dead of plague, but so separated as to prevent any possibility of contact. The cages each consisted of three compartments, the middle compartment being separated from those at each end by rails which, while permitting small objects to pass between them, effectually prevented the monkey in the compartment at one end

putting his hand through to reach or touch the rats in the compartment at the other end. The walls of the cages were constructed of mosquito wire netting, which prevented fleas or mosquitoes in the cage getting outside, though they might readily pass from one compartment of the cage to the other.

In one cage a monkey was placed in one compartment, and a rat sick of plague in the compartment at the opposite end. This rat was covered with fleas; taken out dead three days after, there were no fleas on it. The monkey on the fourth day had a temperature of 104.6. It became dull, did not eat and was evidently sick, with its head down on its breast, and with its hand to its head, but, after this illness had continued for nearly a week, it recovered.

In the other cage a monkey was placed in one compartment, and four dead rats in the compartment at the opposite end. The monkey on the third day had a temperature of 103.8. It also became dull and was evidently sick, but in a few days it recovered.

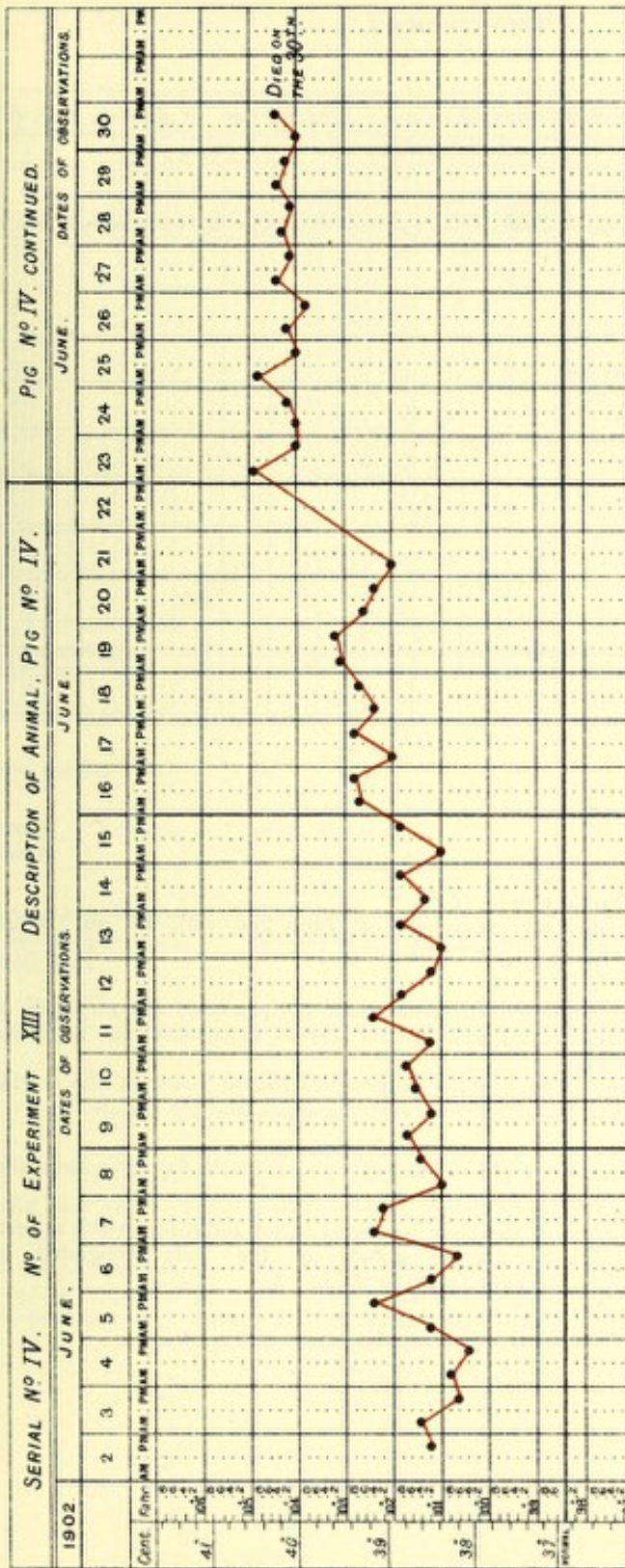
Dr. Hunter writes that one of these monkeys, he does not state which, died of tuberculosis fifty-two days after having been experimented on. A third monkey was fed with a banana smeared with blood of a rat which died of plague, but it remained quite well.

Dogs.

11. Three dogs were fed with plague bubo, but, apart from a rise in temperature of one degree, remained well; subsequently to my leaving Hongkong they were fed on four occasions, but remained quite resistant.

Summary of
experiments
on dogs.

Pigs—continued.



Serial number ...

Number of experiment.

Nature and description of experiment, with date.

Symptoms ...

Result, with date ...

4.

13.

Pig No 4, weight 42 lbs.

Fed on June 2nd with rice and water mixed with lung material from a pneumonic case of plague.

Slight rise of temperature on fifteenth day, which becomes more marked on the 22nd and subsequent days. No diarrhoea.

Died on June 30th, i.e., 28 days after feeding.

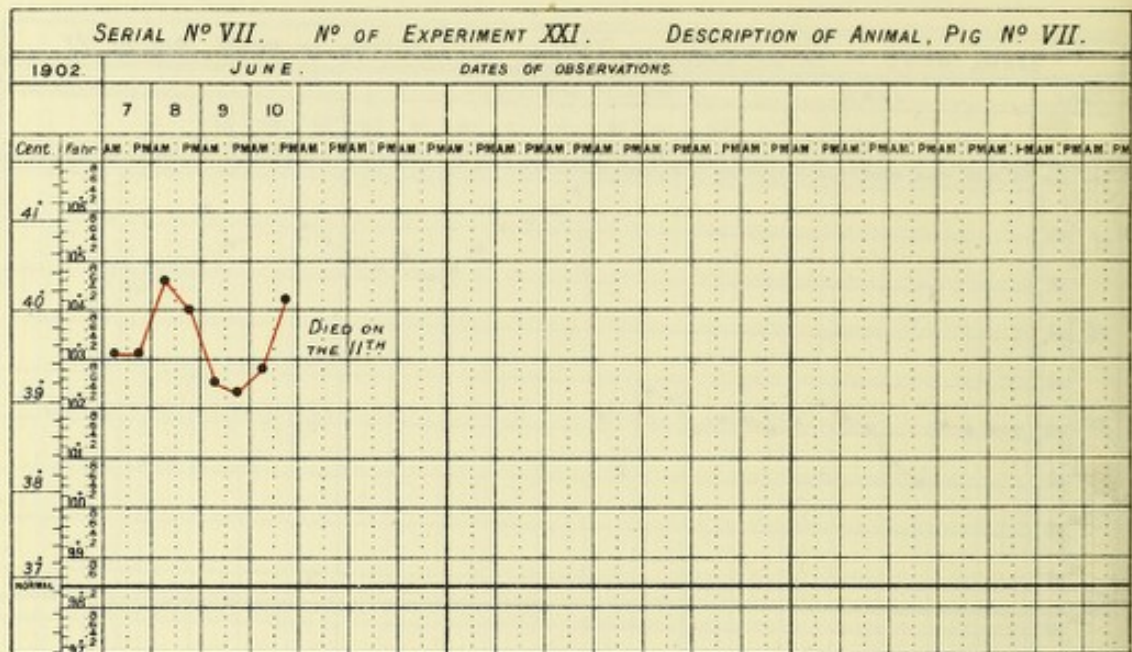
Morbid appearances and bacteriological examination.

Remarks ...

Liver shows "foaming liver" and the bacillus aerogenes capsulatum. Large intestine affected with patchy hemorrhages throughout, small intestines are healthy except two small ulcers in them. Lungs healthy. The mucous membrane of stomach contains small punctiform hemorrhages. Bladder congested in patches. Plague bacilli in heart, spleen, glands, intestinal contents and bladder.

Internal organs congested. Glands of body enlarged, congested and hemorrhagic. The glands of neck and throat appear to be worst.

PIGS—continued.



Serial number ... 7.

Number of experiment. 21.

Nature and description of experiment, with date. Pig No. 7.
Fed on June 7th with organs and blood of Pig No. 5 (Exp. 15), drank a large quantity of the blood.

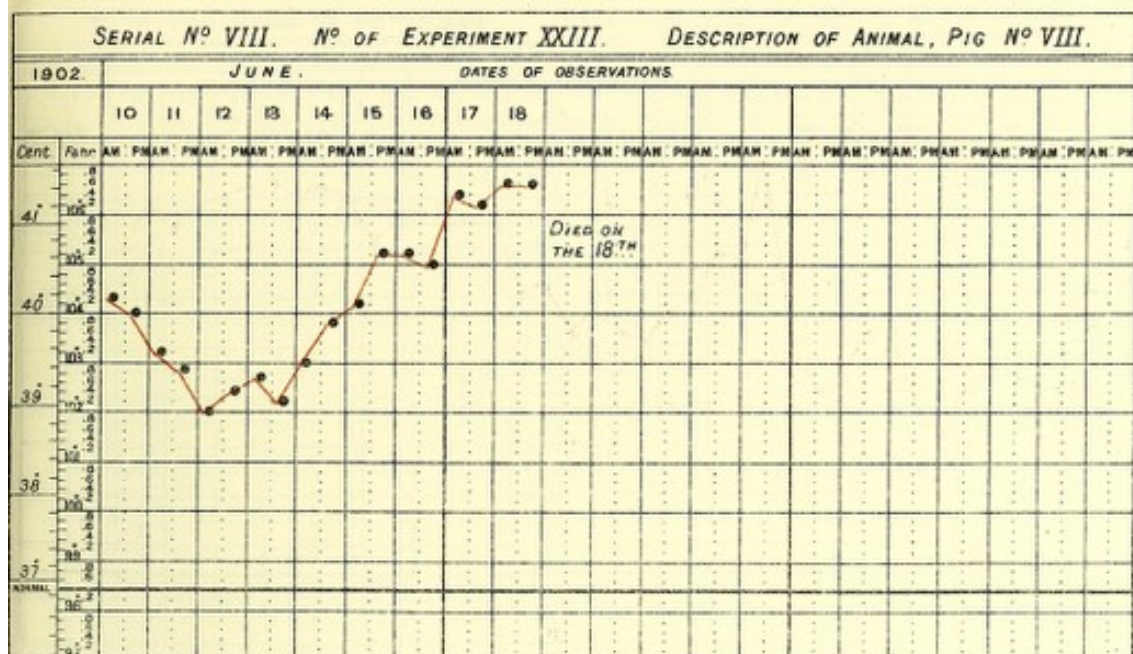
Symptoms ... Was not well on the second day and appeared to be weak in the legs, especially the hind legs. Temperature rose on second day to 104.6.

Result, with date ... Died on June 11th, i.e., on the fourth day after feeding.

Morbid appearances and bacteriological examination. On opening body large intestines observed to be much congested, lungs congested but no pneumonia. Heart full of fluid blood. Spleen not enlarged, slightly congested. Mucous membranes of large intestines very congested and containing large numbers of small haemorrhagic areas varying in size. Mucous membrane of bladder congested and haemorrhagic. Kidneys congested. Glands throughout whole body enlarged, deeply coloured and haemorrhagic in varying degrees. Sub-maxillary glands on both sides caseated. Typical plague bacilli in heart, blood, lungs, spleen, glands, and similar looking bacilli in urine and intestinal contents. No plague bacilli in caseated sub-maxillary gland.

Remarks ... The caseated sub-maxillary glands were evidently the result of some former illness and may have accounted for the rapidity with which the pig took the infection.

PIGS—continued.



Serial number .. 8.

Number of experiment. Exp. 23.

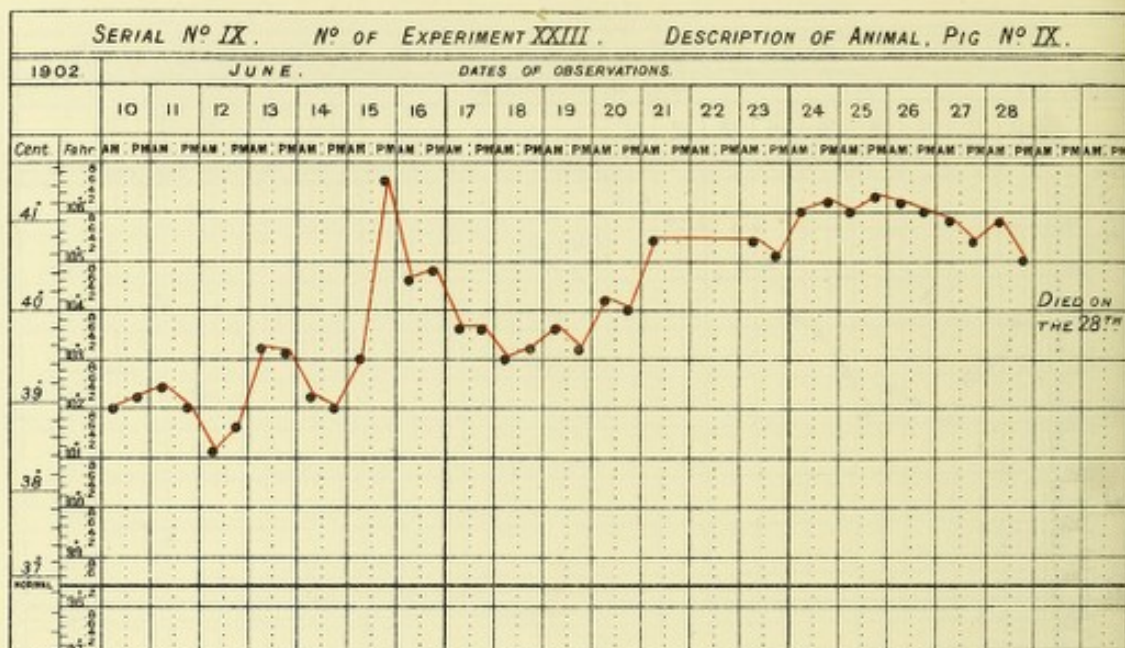
Nature and description of experiment, with date. Pig No. 8, 2 months old, weight 35 lbs. Vaccinated on June 9th on abdomen by means of scarification with fluid from hæmorrhagic glands of buffalo calf (Exp. No. 11), which had died of plague caused by its inoculation with 10 ccs. bouillon emulsion of plague bubo, and two days later with bouillon emulsion of plague pneumonic lung.

Symptoms Temperature rose on second day, declined and again rose on sixth day to 105.2 and continued high on following days. Expansive swelling at seat of scarification. Pig walks with a certain amount of limp and is very unsteady on legs, eyes much congested with a whitish discharge.

Result, with date ... Died on night of June 18th, i.e., on ninth day after the scarification or vaccination.

Morbid appearances and bacteriological examination. Blood dark in colour, coagulates rapidly, tongue congested, larynx healthy, trachea healthy, lungs congested but not pneumonic. Heart full of dark fluid blood, liver healthy, kidney congested and hæmorrhagic, bladder congested, spleen healthy, stomach and small intestines healthy, large intestines healthy. Plague bacilli in blood.

PIGS—continued.



Serial number ... 9.

Number of experiment. 23.

Nature and description of experiment, with date.

Pig No. 9, 2 months old, weight 26 lbs.
Vaccinated on June 9th on abdomen by means of scarification with fluid from hæmorrhagic glands of buffalo calf (Exp. No. 11), which had died of plague caused by its inoculation with 10 ccs. bouillon emulsion of plague bubo, and two days later with bouillon emulsion of plague pneumonic lung.

Symptoms ...

Temperature rose on sixth day to 106.6. On same day the eyes showed congestion with a whitish discharge from them. Seat of scarification superficially necrosed. On seventeenth day the pig is very unwell, lies down, is very unsteady on legs, staggers. Diarrhœa has set in.

Result, with date ...

Died on night of June 28th, i.e., on the nineteenth day after the scarification or vaccination.

Morbid appearances and bacteriological examination.

Organs congested, inguinal glands enlarged, congested and necrosed. The glands in the hinder part of the body are hæmorrhagic as well as being congested, while those in the front part of the body are only congested. Lungs show pneumonic patches, spleen soft, kidneys congested, large intestines inflamed very much in parts. Bladder inflamed, blood fluid but not dark, no marked congestion of muscular or subcutaneous tissue. Plague bacilli in blood, spleen, lungs, and in urine. Plague-looking bacilli in excreta.

PIGS—continued.

Remarks ... During life plague bacilli were found in almost pure culture in the discharges from the eyes, and numerous plague bacilli were found in the pig's urine, also during life.

In addition to these 15 pigs experimented on, the following circumstances are to be noted:—

1. On the 30th of June a pig (Pig No. 16) died which had neither been fed nor inoculated, but which was brought into the shed on the 21st of June in an apparently healthy condition and placed in a pen adjoining those in which pigs 8, 9 and 10 were located, *i.e.*, on the 9th day. This pig showed a moderate amount of congestion of the internal organs, but not sufficient to attract special attention. The mucous membrane of the stomach was inflamed, and the mucous membrane of the large intestines full of small hæmorrhages throughout its length.

The glands of neck and throat were congested and hæmorrhagic, while the other glands of the body were only slightly congested. Plague bacilli were found in the spleen, blood and glands.

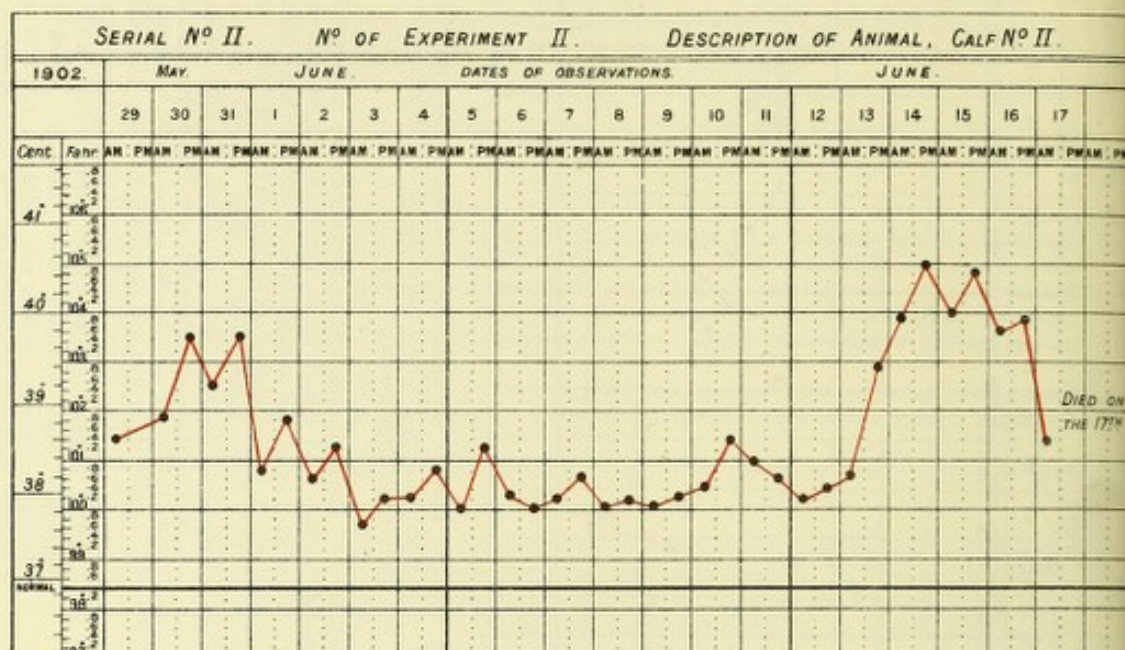
This was a case of natural infection in the pig either before or after it was brought into the shed.

2. On the 5th of July a second pig (Pig 17) died which had neither been fed nor inoculated, but which was brought into the shed on 21st of June in an apparently healthy condition. It was not in the same pen as the foregoing and died on the fourteenth day.

The day before its death there was noticed a large swelling in its throat, and on the chest, neck, abdomen and legs, irregular red and purple patches.

On opening the large swelling of the throat it was found to be a sub-maxillary gland in a cheesy or creamy condition. The other glands were deeply congested, liver congested, kidneys congested, stomach healthy, small intestines healthy, large intestines hæmorrhagic with abrasions of surface in two or three places. Spleen, lungs and blood show no characteristic plague bacilli, but there is a larger and longer bacillus in spleen. The microscopical appearances do not indicate plague.

CALVES—continued.



Serial number ... 2.

Number of experiment. Exp. 2.

Nature and description of experiment, with date. Calf No. 2, weight 156 lbs.

(a) Fed with 15 ccs. bouillon emulsion of bubo from plague case on May 24th.

(b) Fed on June 2nd with 10 ccs. bouillon emulsion of plague pneumonic lung.

Symptoms ... On June 14th, i.e., the sixteenth day of first feeding and twelfth day of second feeding, temperature rose to 105°, the calf was dull and the left præscapular gland enlarged. On June 15th, though temperature above 104° the animal looks better, feeds better, but is weak on legs. On June 16th temp. 103·8; calf feeds better. On June 17th appeared well in the morning, temp. had declined to 101·4. About 10 a.m. suddenly fell down in dying condition. There is apparently a large swelling in floor of mouth.

Result, with date ... Died at 2.15 p.m. on June 17th, i.e., 19 days after first feeding and 15 days after second feeding.

Morbid appearances and bacteriological examination. On opening abdomen no signs of abdominal inflammation. In neck a large mucoid or gelatinous-like mass situated underneath the throat. Blood when exposed quickly coagulates. No marked congestion of organs. A few plague bacilli in blood and in lymphatic glands.

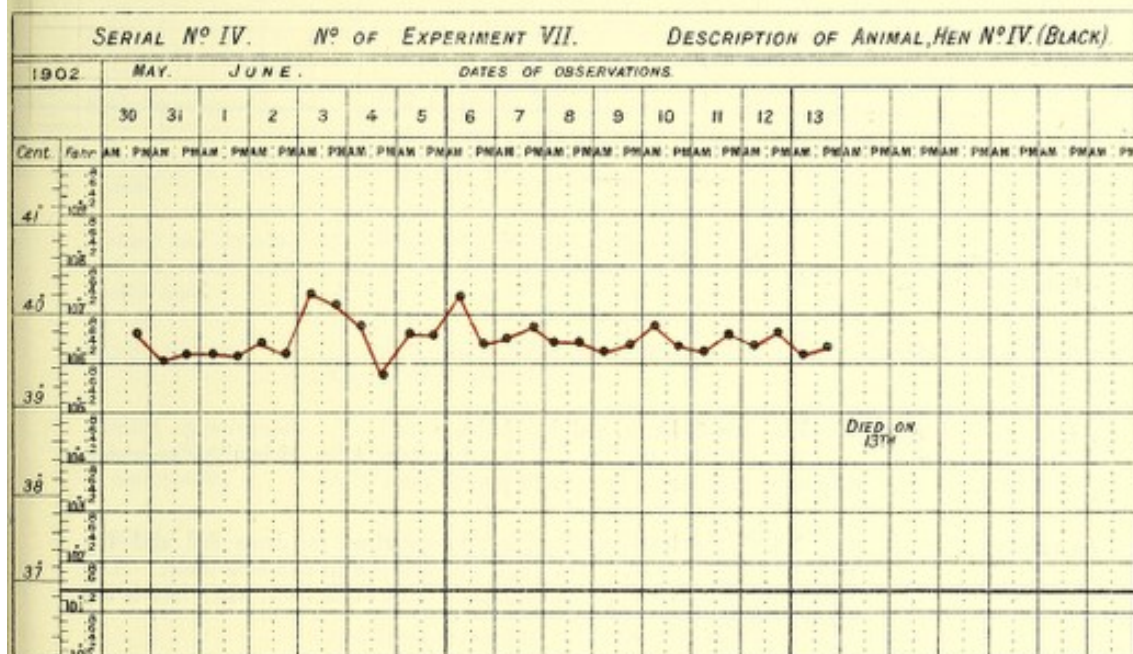
CALVES—continued.

<i>Serial number</i> ...	3.
<i>Number of experiment.</i>	Exp. 3.
<i>Nature and description of experiment, with date.</i>	Calf No. 3, weight 94 lbs. <i>Injected</i> intraperitoneally with 4 ccs. of bouillon emulsion of bubo from plague case on May 29th at 2 p.m.
<i>Symptoms</i> ...	On May 30th off feed.
<i>Result, with date</i> ...	Died at 2 a.m. on May 31st, <i>i.e.</i> , in 36 hours.
<i>Morbid appearances and bacteriological examination.</i>	Seat of insolation in a very congested condition, spleen not enlarged but friable. Heart flabby and yellow, blood fluid. Lungs healthy, intestines healthy, iliac glands soft and congested. Inguinal glands normal, popliteal glands congested and hæmorrhagic, plague bacilli in glands, not noted in which glands.

<i>Serial number</i> ...	4.
<i>Number of experiment.</i>	Exp. 4.
<i>Nature and description of experiment, with date.</i>	Calf No. 4, weight 122 lbs. (a) <i>Injected</i> subcutaneously on May 29th with 8 ccs. of bouillon emulsion of bubo from plague case. (b) <i>Injected</i> subcutaneously on June 2nd with 10 ccs. of bouillon emulsion of plague pneumonic lung.
<i>Symptoms</i> ...	On June 6th temperature rose above 103° and continued above 103° until June 13th. The calf gradually lost weight, and on June 9th lymphatic glands were enlarged and tender, but beyond this no evidence of any illness.

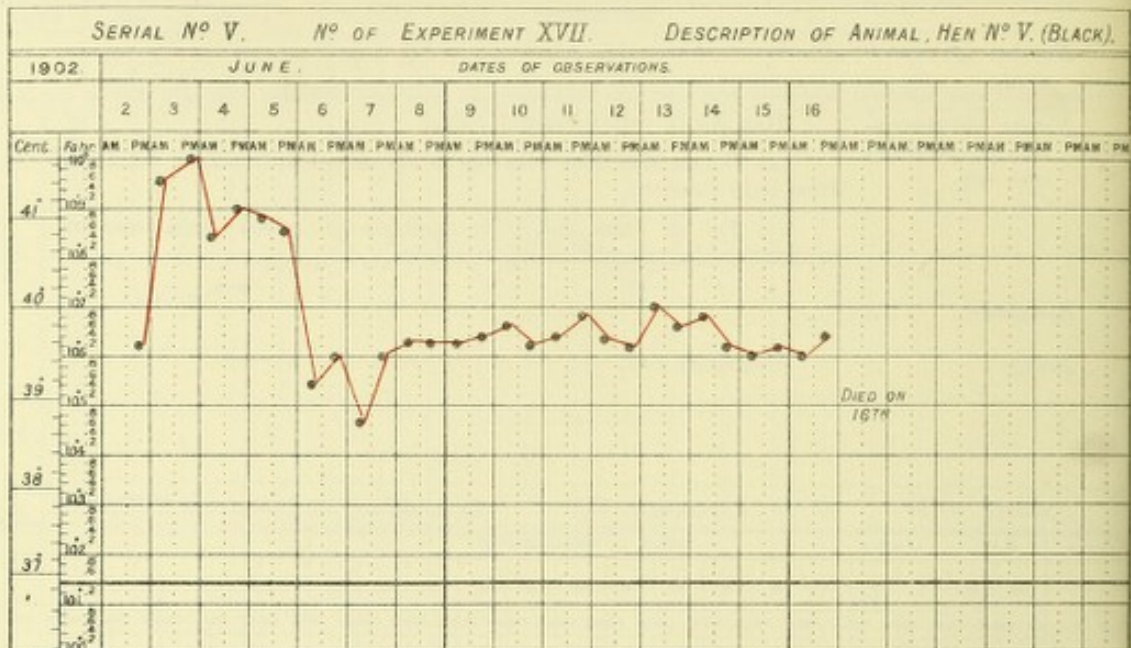
HENS—continued.

<i>Serial number</i> ...	3.
<i>Number of experiment.</i>	7.
<i>Nature and description of experiment, with date.</i>	<p>Hen No. 3, yellow, weight 2 lbs.</p> <p>(a) Fed on May 29th with dry paddy mixed with plague emulsion from bubo (human).</p> <p>(b) Fed on June 2nd with emulsion of spleen from case of septicæmic plague and rice and rice flour.</p>
<i>Symptoms</i> ...	
<i>Result</i> ...	Remained well.



<i>Serial number</i> ...	4.
<i>Number of experiment.</i>	7.
<i>Nature of experiment and description, with date.</i>	<p>Hen No. 4, black, weight $2\frac{1}{2}$ lbs.; in same cage as No. 3.</p> <p>(a) Fed on May 29th with dry paddy mixed with plague emulsion from bubo (human).</p> <p>(b) Fed on June 2nd with emulsion from case of septicæmic plague and rice and rice flour.</p>
<i>Symptoms</i> ...	Remained well until June 13th.
<i>Result, with date</i> ...	Died on night of June 13th, <i>i.e.</i> , on the fifteenth day of the first feeding and on the eleventh day of second feeding.
<i>Morbid appearances and bacteriological examination.</i>	Post mortem on the 14th of June. Liver enlarged and soft, spleen enlarged, lungs in a state of decomposition. Early decomposition has evidently set in. Plague bacilli in blood and spleen.

HENS—continued.



Serial number ... 5.

Number of experiment. 17.

Nature and description of experiment, with date. Hen No. 5, black, weight $1\frac{1}{2}$ lbs. Injected on June 2nd into breast muscle, 4 ccs. of bouillon emulsion of plague pneumonic lung from plague case.

Symptoms ... No visible local reaction, but temperature on June 3rd and 4th rose to 109 and 110°. On June 5th hen is dull and eats little. The dullness and loss of appetite continues until June 16th, when hen is too weak to stand.

Result, with date ... Died during the night of June 16th, i.e., on fifteenth day of inoculation.

Morbid appearances and bacteriological examination. Organs in a state of general congestion. Plague bacilli in blood and spleen.

Remarks ... Organs used for feeding experiments Nos. 34, 37, 38, and 39.

HENS—continued.

<i>Serial number</i> ...	6.
<i>Number of experiment.</i>	17.
<i>Nature and description of experiment, with date.</i>	Hen No. 6, yellow, weight 2 lbs. Injected into breast muscle, 4 ccs. of bouillon emulsion of plague pneumonic lung from plague case on June 2nd.
<i>Symptoms</i> ...	No visible local reaction. Temperature on June 3rd and 4th rose to 110°.
<i>Result, with date</i> ...	Died on night of June 4th, i.e., on second of inoculation.
<i>Morbid appearances and bacteriological examination.</i>	Internal organs congested. Plague bacilli in spleen, liver, and blood.

<i>Serial numbers</i> ...	7, 8, 9, 10, 11, 12.
<i>Number of experiment.</i>	30. (Hen to Hen.)
<i>Nature and description of experiment, with date.</i>	Three hens in same cage No. 7, black, No. 8, white, and No. 9, yellow, were fed with organs of Hen No. 1, on June 9th. (Exp. 6).
<i>Result, with date</i> ...	Hen No. 7, black, died on June 11th, i.e., two days after feeding. Two hens remained well.
<i>Morbid appearances and bacteriological examination.</i>	The most noteworthy point is the congestion over crop. Liver slightly fatty, no marked congestion. Plague bacilli in heart blood in enormous numbers.
<i>Remarks</i> ...	Two hens in neighbouring cage containing three hens also accidentally got some of the material for feeding and died on the 11th of June. Plague bacilli were found in both in large numbers. Of six hens, three probably got a fair quantity of material to feed on, and these three died. If the others got any, it was small in quantity, as the material was eaten up so quickly by the hens that got the first chance.

<i>Serial numbers</i> ...	13, 14, 15.
<i>Number of experiment.</i>	44.
<i>Nature and description of experiment, with date.</i>	Calf to Hen. Hens Nos. 13, 14 and 15, in same cage fed on June 16th with glands of Calf No. 6. (Exp. 24.)
<i>Result, with date</i> ...	No. 13 died on June 18th, i.e., 46 hours after feeding.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood.

HENS—continued.

<i>Serial numbers</i> ...	16, 17, 18.
<i>Number of experiment.</i>	49.
<i>Nature and description of experiment, with date.</i>	Monkey to Hen. Fed on June 18th with internal organs of Monkey No. 1. (Exp. 31.)
<i>Result</i> ...	No result.

<i>Serial numbers</i> ...	19, 20.
<i>Number of experiment.</i>	53.
<i>Nature and description of experiment, with date.</i>	Pig to Hen. Hens 19 and 20 fed on June 19th with organs of Pig No. 8 (Exp. 23.)
<i>Result</i> ...	No result.

<i>Serial numbers</i> ...	21, 22.
<i>Number of experiment.</i>	58.
<i>Nature and description of experiment, with date.</i>	Pig to Hen. Hens 21 and 22 fed on June 20th with lungs and organs of Pig No. 10. (Exp. 26.)
<i>Result, with date</i> ...	Hen No. 21 died on June 22nd.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood.

<i>Serial number</i> ...	23.
<i>Number of experiment.</i>	60.
<i>Nature and description of experiment, with date.</i>	Rat to Hen. Hen No. 23 fed on June 22nd with internal organs of Rat. (Exp. 28.)
<i>Result, with date</i> ...	Died on night of June 24th.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood.

HENS—continued.

<i>Serial numbers</i> ...	24, 25, 26, 27.
<i>Number of experiment.</i>	64.
<i>Nature and description of experiment, with date.</i>	Hens 24, 25, 26 and 27 fed on June 24th with portions of bubo from a case of bubonic plague (human). On July 3rd, <i>i.e.</i> , on ninth day, Hen 24 appeared dull.
<i>Result, with date</i> ...	Hen 24 died on July 4th, <i>i.e.</i> , on tenth day after feeding.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood and spleen.

<i>Serial numbers</i> ...	28 and 29.
<i>Number of experiment.</i>	66.
<i>Nature and description of experiment, with date.</i>	Pig to Hen. Hens 28 and 29 fed on June 25th with organs of Pig No. 13. (Exp. 54.)
<i>Result</i> ...	No result.

<i>Serial numbers.</i>	30 and 31.
<i>Number of experiment.</i>	69.
<i>Nature and description of experiment, with date.</i>	Rat to Hen. Hens 30 and 31 fed on June 27th with internal organs of a rat which had died of plague.
<i>Result</i> ...	No result.

The groups of Hens were in different cages, but each group was in one cage, and as there was always a struggle between those in the same cage to secure the food, some in one group consumed a much larger quantity of plague material than others in the same group, while some hardly succeeded in getting any.

15. DETAILS OF EXPERIMENTS ON VARIOUS OTHER BIRDS.

PIGEONS.

<i>Serial numbers ...</i>	1, 2.
<i>Number of experiment.</i>	16.
<i>Nature and description of experiment, with date.</i>	Pigeons Nos. 1 and 2, injected on June 2nd into breast muscle 2 ccs. of bouillon emulsion of plague pneumonic lung.
<i>Result, with date ...</i>	Died within 12 hours on June 3rd.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood.
<hr/>	
<i>Serial numbers ...</i>	3, 4.
<i>Number of experiment.</i>	39.
<i>Nature and description of experiment, with date.</i>	Pigeon No. 3, fed on June 14th with internal organs of Hen No. 4 (Exp. 7) which died of plague.
<i>Result, with date ...</i>	Died in 24 hours on June 15th.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood and spleen.
	Pigeon No. 4, in same cage as No. 3, fed on June 14th with internal organs of Hen No. 4 (Exp. 7) which died of plague.
<i>Result ...</i>	Remained well.
<i>Remarks ...</i>	This pigeon was fed on June 30th with glands of pig (No. 16) which had died of plague. The pigeon died on the night of July 2nd. Its organs were much congested, especially its crop, and plague bacilli were found in its blood and spleen.
<i>Exp. 75</i>	
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TURKEYS AND DUCKS.

Serial numbers ... 5, 6, 7, 8, 9, 10.

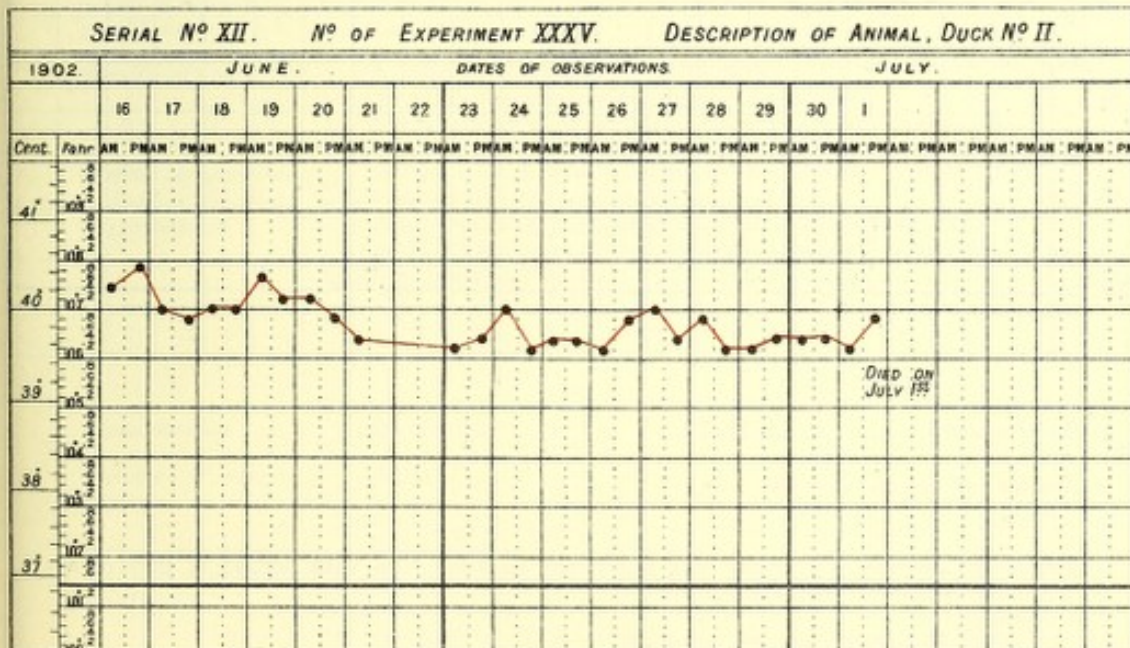
Number of experiment. 34.

Nature and description of experiment, with date. Turkeys, Nos. 1, 2, 3, 4, 5, 6 placed in the same cage and
 (a) Fed on June 14th with internal organs of Hen No. 4 (Exp. 7) which died of plague.
 (b) Fed on June 17th with internal organs of Hen No. 5 (Exp. 17) which died of plague.

Result, with date ... No. 1 died on night of June 17th, *i.e.*, three days after feeding.
 No. 4 died on night of July 1st, *i.e.*, on the seventeenth day after first feeding or the fourteenth day after second feeding.

Morbid appearances and bacteriological examination. No. 1 exhibited no marked congestion, but there were plague bacilli in blood.
 The organs of No. 4 were deeply congested and dark coloured. Plague bacilli in blood and spleen.
 Turkeys Nos. 2, 3, 5 and 6 remained well.

Dr. Hunter writes that two other turkeys died of plague, one on July 24th, the other on July 31st, *i.e.*, 40 and 47 days after first feeding, or 37 and 44 days after second feeding.



Serial Numbers ... 11, 12, 13.

Number of experiment. 35.

Nature and description of experiment, with date. Ducks 1, 2, and 3 fed on June 13th with plague material from spleen of a plague case.

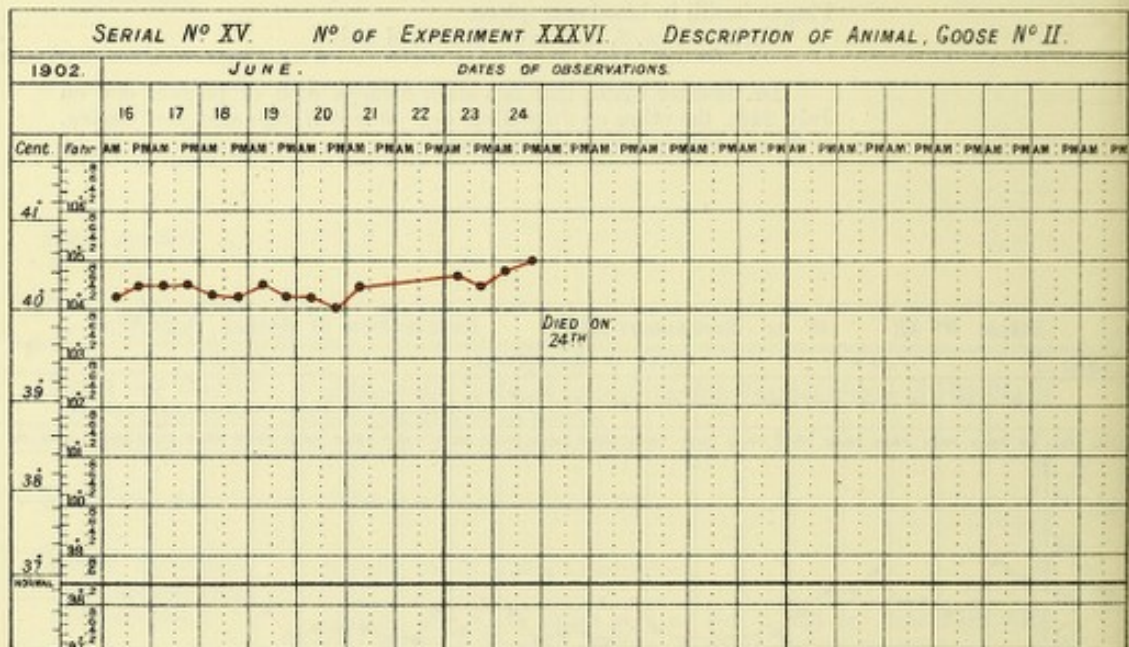
TURKEYS AND DUCKS—continued.

Result, with date ... No. 2 died on night of July 1st, i.e., on the eighteenth day after feeding.

Morbid appearances and bacteriological examination. Internal organs except lungs much congested. Plague bacilli in blood and spleen.

Dr. Hunter writes that since my departure from Hongkong the two remaining ducks died of plague, one on July 31st, the other on the 7th August, i.e., 47 and 54 days after feeding.

GESE AND DUCKS.



Serial numbers ... 14, 15, 16.

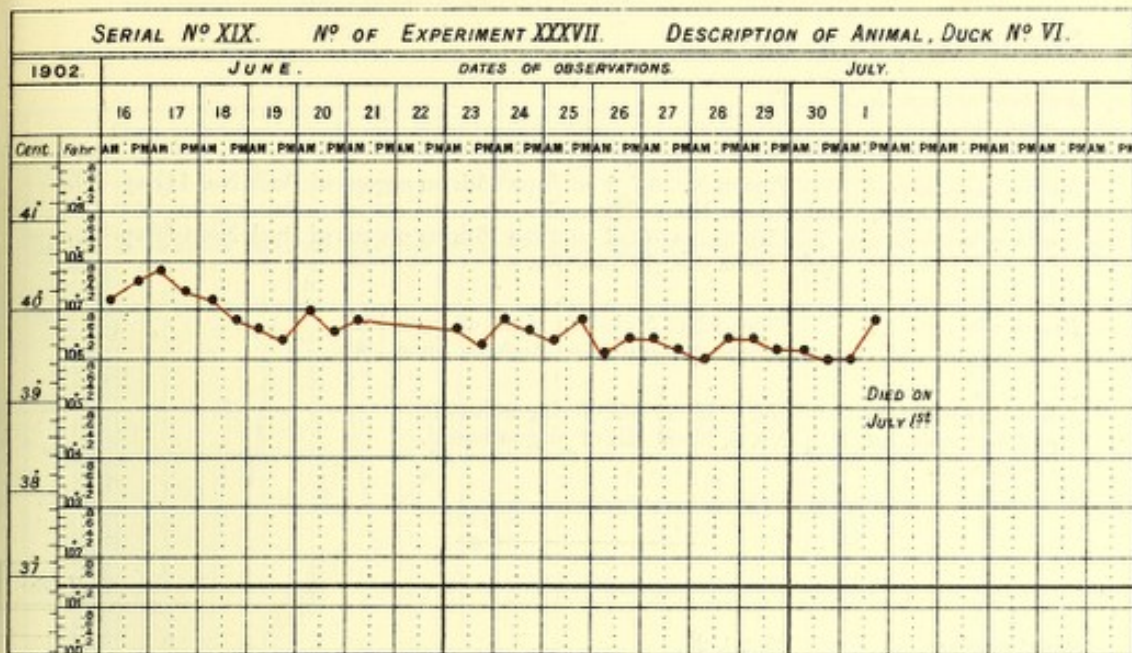
Number of experiment. 36.

Nature and description of experiment, with date. Geese Nos. 1, 2, 3 fed on June 13th with portion of bubo of a plague case.

Result, with date ... No. 2 died on the night of June 24th, i.e., on the eleventh day after feeding.

Morbid appearances and bacteriological examination. Plague bacilli in blood and spleen.

GEESE AND DUCKS—continued.



Serial numbers ... 17, 18, 19.

Number of experiment. 37.

Nature and description of experiment, with date. Ducks Nos. 4, 5, 6, in same cage fed on June 14th with internal organs of Hen No. 4 (Exp. 7) which died of plague.

Result, with date ... No. 4 died in 24 hours on June 15th.
No. 5 died in 2½ days on night of June 16th.
No. 6 died on night of July 1st, i.e., in 17 days after feeding.

Morbid appearances and bacteriological examination. In No. 4 heart blood was full of characteristic plague bacilli, but somewhat smaller than usual in human plague.
No. 5 exhibited plague bacilli in blood and spleen.
In No. 6 the internal organs except lungs much congested. Plague bacilli in blood and spleen.

Serial numbers ... 20, 21, 22.

Number of experiment. 38.

Nature and description of experiment, with date. Geese Nos. 4, 5, 6 in same cage.
(a) Fed on June 14th with internal organs of Hen No. 4 (Exp. 7).
(b) Fed on June 17th with internal organs of Hen No. 5 (Exp. 17).

Result, with date ... No. 6 died on the 18th June, i.e., 72 hours after first feeding.

Morbid appearances and bacteriological examination. Slight congestion of internal organs, but no very noticeable appearance. Plague bacilli in blood.
Dr. Hunter writes that a second goose died of plague on July 22nd, i.e., 38 days after first feeding, and 35 days after second feeding.

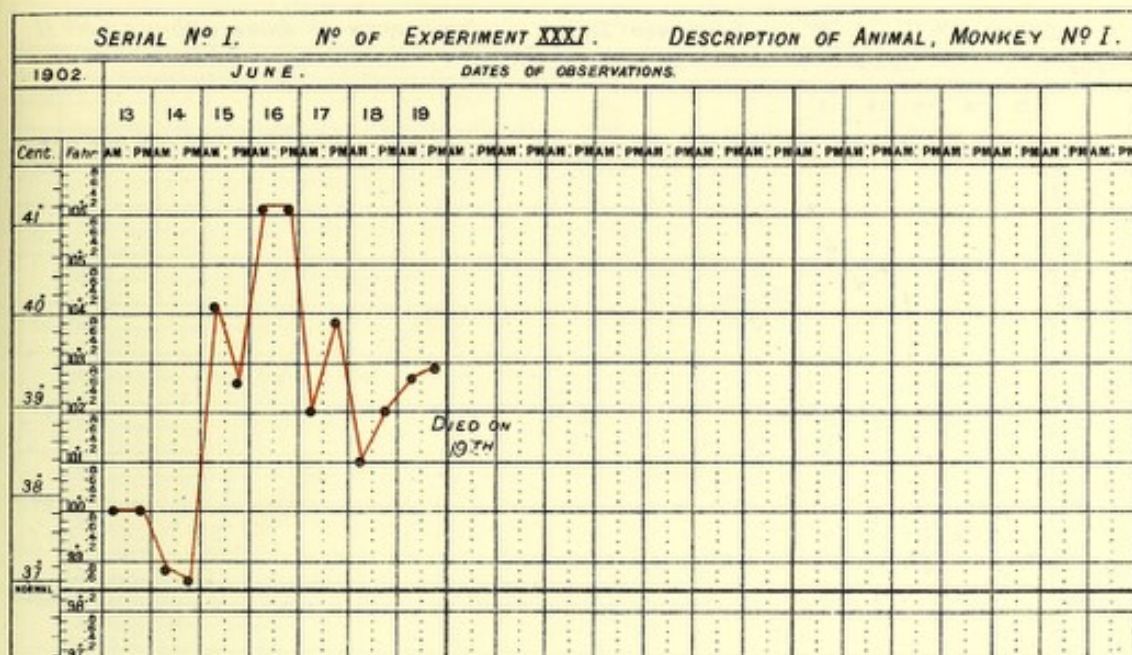
PIGEONS AND BIRDS—continued.

<i>Serial numbers</i> ...	23, 24.
<i>Number of experiment.</i>	41.
<i>Nature and description of experiment, with date.</i>	Pigeon No. 5 fed on June 15th on organs of Duck No. 4 (Exp. 37), and Pigeon No. 3 (Exp. 39). Pigeon No. 6 fed on June 15th on organs of Duck No. 4 (Exp. 37), and Pigeon No. 3 (Exp. 39).
<i>Result, with date</i> ...	Pigeon No. 5 died on night of June 16th. Pigeon No. 6 died on night of June 18th.
<i>Morbid appearances and bacteriological examination.</i>	No. 5, blood full of plague bacilli. No. 6, blood full of plague bacilli.

<i>Serial numbers</i> ...	25, 26, 27.
<i>Number of experiment.</i>	70.
<i>Nature and description of experiment, with date.</i>	Red beak birds Nos. 1, 2 and 3 fed on June 23rd with glands of Calf No. 1.
<i>Result, with date</i> ...	Nos. 1 and 2 died on night of June 27th, <i>i.e.</i> , four days after feeding.
<i>Morbid appearances and bacteriological examination.</i>	Plague bacilli in blood of both.

<i>Serial number</i> ...	28.
<i>Number of experiment.</i>	75.
<i>Nature and description of experiment, with date.</i>	Pigeon No. 7 fed on June 30th with gland of Pig No. 16 (Exp. 74), which had died of plague by natural infection.
<i>Result, with date</i> ...	Died on July 3rd, <i>i.e.</i> , on the third day.
<i>Morbid appearances and bacteriological examination.</i>	Organs very much congested, especially the crop. Plague bacilli in spleen and blood.

16. DETAILS OF EXPERIMENTS ON MONKEYS.



Serial number ... 1.

Number of experiment. 31.

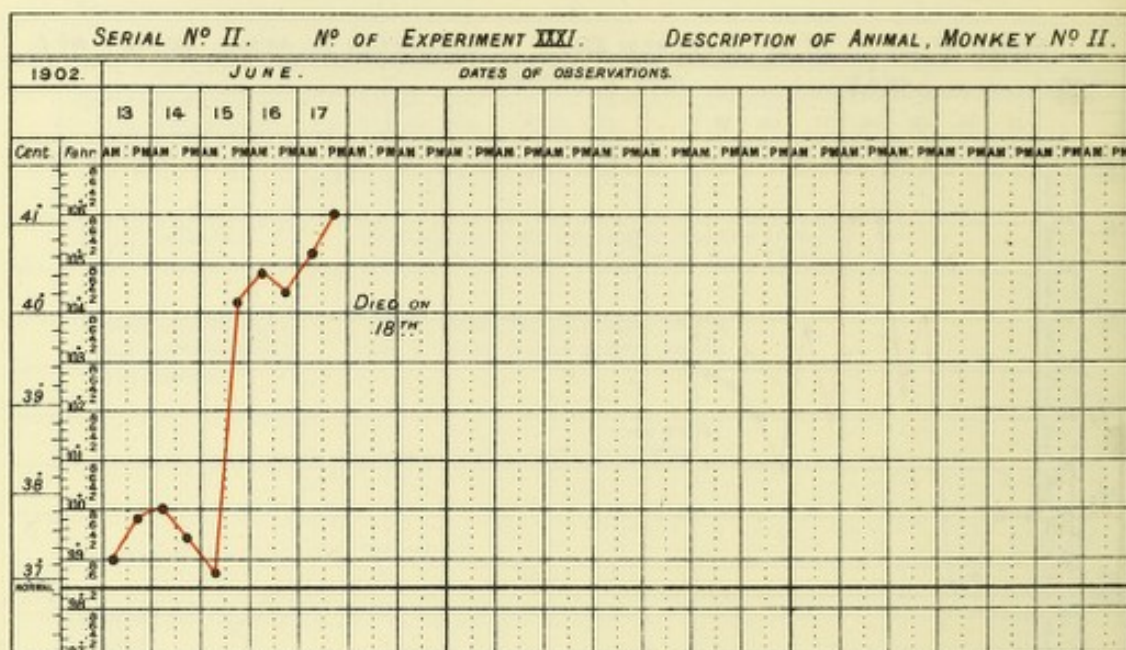
Nature and description of experiment, with date. Monkey No. 1 inoculated on June 12th with blood from heart of a rat dead of plague from feeding on organs of Calf Buffalo No. 5.

Symptoms ... June 15th, very dull, temp. in afternoon 104.2.
 June 16th, very dull, does not eat. Morning temp. 106, afternoon temp. 106.2, temp. at 9 p.m. 105.6.
 June 17th, very dull, does not eat; holds head down. Morning temp. 102, afternoon temp. 103.8.
 June 18th, looks slightly better, eats more. Morning temp. 101, afternoon temp. 102.
 June 19th, still very dull, holds head down on breast. Morning temp. 102.6, afternoon temp. 102.8.

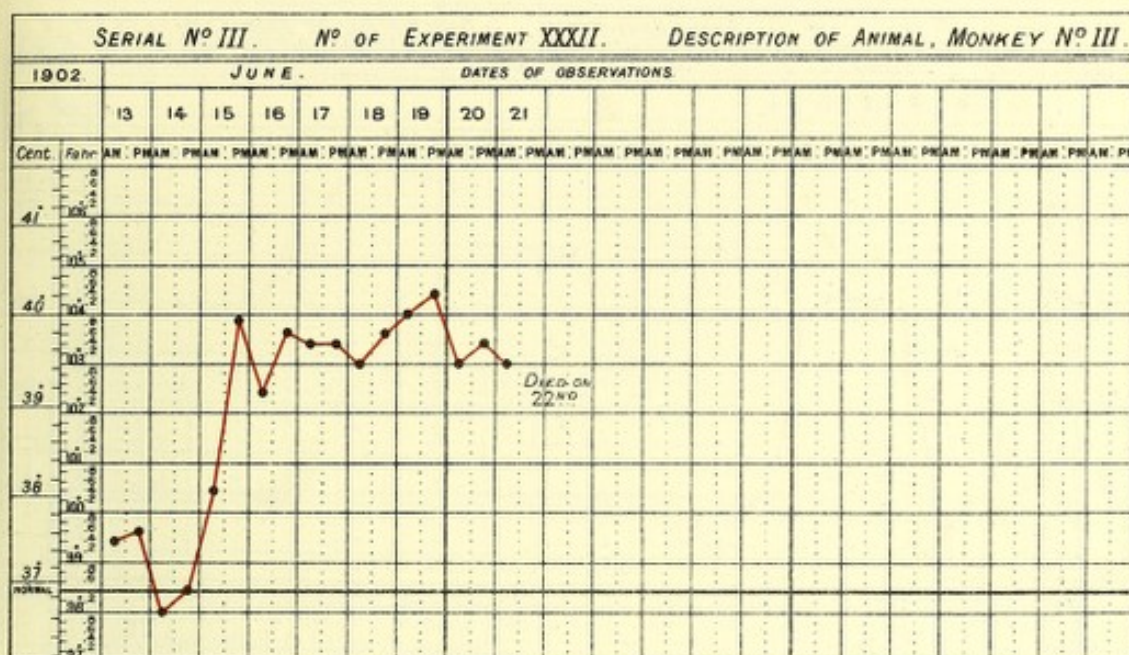
Result, with date ... Died on the night of June 19th, i.e., on the seventh day.

Morbid appearances and bacteriological examination. No very marked congestion of any of the organs. Lungs healthy, all the glands of the body slightly congested, plague bacilli in blood, spleen and glands.

MONKEYS—continued.



MONKEYS—*continued.*



Serial number 3.

<i>Number of experi-</i>	32.
<i>ment.</i>	

Nature and description of experiment, with date. Monkey No. 3. Into same cage placed a rat on June 12th, dead of plague from feeding on organs of Buffalo Calf No. 5.

<i>Symptoms ...</i>	...	June 15th, very dull. Afternoon temp. 103.9.
		June 16th, does not eat. Morning temp. 102.4, afternoon temp. 103.6, evening at 9 p.m. 104.4.
		June 17th, very dull. Morning temp. 103.4, afternoon temp. 103.4.
		June 18th, looks better, is more lively and eats. Morning temp. 103, afternoon temp. 104.4.
		June 20th, dull again, eats very little.
		June 22nd, better to-day, eats a little.

Result, with date ... Died on the night of 22nd, i.e., between the tenth and eleventh day.

Morbid appearances and bacteriological examination. Organs in a general state of congestion, glands congested but not enlarged. Plague bacilli in spleen and glands, but only a few in heart blood.

SHEEP—continued.

Serial number ... 3.

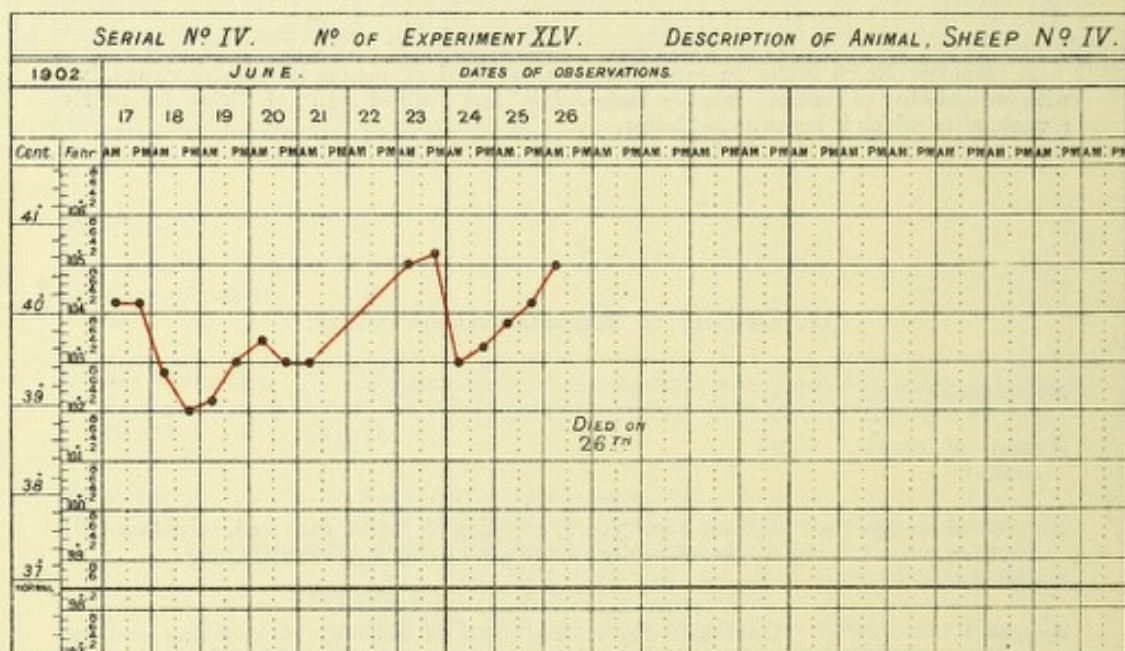
Number of experiment. 19.

Nature and description of experiment, with date. Fed Sheep No. 2, weighing 62 lbs. on June 2nd, with 40 ccs. of bouillon emulsion of spleen from septicæmic plague.

Symptoms ... Was not well on fourth day, had jerky breathing and ate very little. The sheep recovered from this in about four days and appeared well until the day before its death, when the difficulty in breathing returned.

Result, with date ... Died on July 16th, i.e., 34 days after feeding.

Morbid appearances and bacteriological examination. Spleen and internal organs congested, glands hæmorrhagic, lungs much congested with black patches, bladder healthy, large intestine hæmorrhagic, small intestine and stomach healthy. Plague bacilli in blood, spleen, kidneys, bladder and glands.



Serial number ... 4.

Number of experiment. 45.

Nature and description of experiment, with date. Sheep No. 4 fed on June 16th with about a pint of blood from Calf No. 6, which died of plague (Exp. 24).

Symptoms ... Difficulty of breathing and weakness set in on June 25th, i.e., on ninth day.

Result, with date ... Died on June 26th, i.e., on tenth day.

Morbid appearances and bacteriological examination. All organs congested, lungs deeply congested, glands not enlarged but congested, mucous membrane of intestines and stomach congested in patches in varying degree. Plague bacilli in blood, spleen, lungs and glands.

18. DETAILS OF EXPERIMENTS ON RATS.

The rats were kept in separate cages in separate boxes, a single rat being in each cage except the first two rows where two rats were kept in each cage.

EXPERIMENT 8, 9, 10.	Three rats fed with plague material of Calf No. 3 which had died from intraperitoneal injection of plague material from a plague case. Two rats died, one in 43 hours the other in 72 hours. Both showed plague bacilli. The third died on the eighteenth day, but doubtful whether from plague.
EXPERIMENT 20. Row I.	Twelve rats fed with plague material from plague case. As none died of plague in nine days, ten were fed with internal organs of Hen No. 7 (Exp. 30) and two other hens which had died of plague. Between the second and sixth day, five of the rats died with plague bacilli in their blood; four others died, one on the thirteenth day, one on the fifteenth day, one on the sixteenth day, and one on the twenty-first day, but only the last one showed typical plague bacilli.
EXPERIMENT 25. Row II.	Twelve rats fed with hæmorrhagic glands of water Buffalo Calf No. 5 (Exp. 11) which had died of plague from a subcutaneous injection of plague material. Between the second and sixth day ten rats were dead with plague bacilli in their blood. The remaining two died of plague on the twenty-third and twenty-fourth day.
EXPERIMENT 28. Row III.	Four rats fed with glands and internal organs of Pig No. 6 (Exp. 21) which had died of plague after feeding on internal organ of Pig No. 5 (Exp. 15), one died on seventh day, but doubtful whether from plague; two died with plague bacilli in blood on eleventh day, and the fourth on the seventeenth day, but not of plague.
EXPERIMENT 40. Row IV.	Six rats fed with organs of Pigeon No. 3 and Duck No. 4 (Exps. 39 and 37) which had died of plague from being fed with Hen 4 (Exp. 7), which died of plague. Between the second and the fifth day the six rats were dead with plague bacilli in their blood.
EXPERIMENT 43. Row V.	Six rats fed with glands and heart of Calf No. 6 (Exp. 24) which had died of plague from having its abdomen scarified and smeared with plague material from Buffalo Calf No. 5 (Exp. 11), five died between the second and ninth day, but only one contained typical plague bacilli.
EXPERIMENT 47. Row VI.	Six rats fed with internal organs of Turkey No. 1 (Exp. 34) which had died of plague from being fed with Hen 4 (Exp. 7). Between the first and fifteenth day the six rats were dead, five with plague bacilli in blood, the other doubtful.
EXPERIMENT 48. Row VII.	Six rats:— (a) Three fed with organs of Pigeon No. 5 (Exp. 41) which had died of feeding on organs of Duck No. 4 (Exp. 37) and Pigeon No. 3 (Exp. 39). Of these two died within two days with plague bacilli in blood. (b) Three fed with organs of Hen No. 13 (Exp. 44) which had died of plague from feeding on glands of Calf No. 6 (Exp. 24). One died of plague in two days, another of plague in fourteen days, and the third remained well.
EXPERIMENT 50. Row VIII.	Six rats fed with internal organs of Monkey No. 2 (Exp. 31) which had died of plague from inoculation with blood of a rat dead of plague. Between one and six days five rats were dead with plague bacilli in blood. The sixth rat died on the fourteenth day with plague bacilli in blood.
EXPERIMENT 51. Row IX.	Six rats fed with organs of Monkey No. 4 (Exp. 33) which died of plague after feeding with banana smeared with blood of rat which had died of plague. One died next day but not of plague. Between the third and eighth day four rats died with plague bacilli in their blood.
EXPERIMENT 52. Row X.	Six rats fed with organs of Pig No. 8 (Exp. 23) which died of plague from inoculation by scarification on abdomen with fluid from hæmorrhagic gland of Buffalo Calf No. 5 (Exp. 11). Between the fourth and the ninth day four rats died, three of which had plague bacilli in blood, the fourth was doubtful. On the thirteenth day the fifth rat died of plague. The sixth remained well.
EXPERIMENT 55. Row XI.	Three rats fed with organs of Monkey No. 1 (Exp. 31) which had died of plague from inoculation with blood of plague-infected rat. Between the third and the fourth day the three rats were dead with plague bacilli in their blood.

EXPERIMENT 57. Row XII.	Three rats were fed with lungs and organs of Pig No. 10 (Exp. 26) which died of plague from vaccination and scarification on abdomen with pulp from organs of Pig No. 7 (Exp. 21). One rat died with plague bacilli in six days.
EXPERIMENT 61. Row XIII.	Six rats fed with organs of Pig No. 6 (Exp. 21) which died of plague from feeding on organs of Pig No. 5 (Exp. 15) which died of plague from inoculation with emulsion of pneumonic lung from a plague case. Between the third and tenth day the six rats died, five of plague, the other with no microscopical signs of plague.
EXPERIMENT 62. Row XIV.	Six rats fed with portion of bubo from a bubonic case of plague. Within three days five rats were dead, three with plague bacilli, the other doubtful on account of decomposition.
EXPERIMENT 63. Row XV.	Three rats fed with portion of bubo from a bubonic case. Two rats died within twenty-four hours with plague bacilli in blood.
EXPERIMENT 65. Row XVI.	Three rats fed with glands of Calf No. 1 (Exp. 1) which died of plague from feeding with emulsion of plague material from a plague case. One rat died on the fourth day, a second rat on the eleventh day, both with plague bacilli in their blood. One rat remained well.
EXPERIMENT 66. Row XVII.	Six rats fed with internal organs of Pig No. 13 (Exp. 54) which died from feeding on organs of Pig No. 8 (Exp. 23). Between the fourth and seventh day four rats died with plague bacilli in blood.
EXPERIMENT 78. Row XVIII.	Six rats fed with glands of Pig No. 16 which died of plague. Four rats died with plague bacilli in their blood in four days.

19. DETAILS OF EXPERIMENTS ON GUINEA-PIGS.

EXPERIMENT 5.	A guinea-pig inoculated with 1 cc. of gland emulsion from plague case died in 16½ hours. Plague bacilli in blood.
EXPERIMENT 22.	A guinea-pig scarified on abdomen and the scarification smeared with hæmorrhagic gland substance from Buffalo Calf No. 5 (Exp. 11) died in 18 hours. Plague bacilli in blood.
EXPERIMENT 73.	(a) Guinea-pig inoculated with culture from bacilli in pig No. 14 (Exp. 54) died in two days with plague bacilli in blood and internal organs. (b) Guinea-pig inoculated with culture from bacilli in sheep No. 4 (Exp. 45) died in three days with plague bacilli in blood, spleen and glands. Gland in groin crowded with bacilli. (c) Guinea-pig inoculated with culture of bacilli from Hen No. 7 (Exp. 30) died in two days with plague bacilli in blood and internal organs.
EXPERIMENT 74a.	(a) Guinea-pig inoculated with spleen pulp of Pig No. 9 (Exp. 23) died on third day. Plague bacilli in blood, spleen and glands. (b) Guinea-pig inoculated with gland juice of Pig No. 9 (Exp. 23) died on third day. Plague bacilli in blood.

20. CONCLUSIONS.

From the foregoing experiments it is evident :

1. That plague material from Man will give plague to :

- (a) Pigs by inoculation (Experiments 12 and 15)
 by feeding (Experiment 13)
- (b) Calves by inoculation (Experiments 3 and 4 and 11)
 by feeding (Experiments 1 and 2)

- (c) Hens by inoculation (Experiment 17)
 by feeding (Experiments 6, 7, 64)
- (d) Ducks by feeding (Experiment 35)
- (e) Geese by feeding (Experiment 36)
- (f) Rats by feeding (Experiments 62, 63)
- (g) Sheep by feeding (Experiment 19)

2. That plague material from Pigs will give plague to :

- (a) Pigs by inoculation (Experiment 26)
 by feeding (Experiments 21, 27, 54)
- (b) Hens by feeding (Experiment 58)
- (c) Pigeons by feeding (Experiment 75)
- (d) Rats by feeding (Experiments 28, 52, 57, 61, 66, 78)

3. That plague material from Calves will give plague to :

- (a) Calves by inoculation (Experiment 24)
 by feeding (Experiment 42)
- (b) Pigs by inoculation (Experiment 23)
- (c) Hens by feeding (Experiment 44)
- (d) Rats by feeding (Experiments 8, 9, 10, 25, 43, 65)
- (e) Sheep by feeding (Experiment 45)

4. That plague material from Hens will give plague to :

- (a) Hens by feeding (Experiment 30)
- (b) Ducks by feeding (Experiment 37)
- (c) Turkeys by feeding (Experiment 34)
- (d) Geese by feeding (Experiment 38)
- (e) Pigeons by feeding (Experiment 39)
- (f) Rats by feeding (Experiments 20, 48)
- (g) Pigs by feeding (Experiment 59)

5. That plague material from Rats will give plague to :

- (a) Monkeys by feeding (Experiment 33)
 by inoculation (Experiment 31)
 by contact (Experiment 32)
 without contact (Experiment 68)
- (b) Hens by feeding (Experiment 60)

6. That plague material from Monkeys will give plague to :

- (a) Rats by feeding (Experiments 50, 51, 55).

Man with plague can infect the domestic animals, and they in turn can affect one another.

21. Not only, then, can the infective material from man infect pigs, calves, hens, ducks, geese, rats and sheep, but their infective material can also in their turn infect one another. More than this, the infective material of a plague rat can cause plague in monkeys, and the infective material of a monkey with plague can give rats plague. What is here proved to be the case with experiments in monkeys, namely, that rat plague is communicable to them by feeding, inoculation, contact and without contact with rat plague material, is likely also to apply to man.

Plague is consequently not a disease confined to man. The infective material from him is liable, if eaten by rats or other animals, to give them plague, and they in their turn are likely to spread it among the animals and poultry of the farm-yard or house-yard in which these are kept and again pass it on to man. The rat is apparently the most important agent in disseminating plague. It has relations both with man's house and with the premises on which the animals mentioned are kept. To both it is attracted by food, and should infective material be in either place its susceptibility to plague by feeding on infective material, from whatever source derived, is likely to favour its chance of being attacked with plague and, when attacked, it generally carries the disease elsewhere.

Domestic animals suffer from chronic, as well as acute, plague.

22. A fact to be noted is that after the infection enters the body by the alimentary canal, a considerable period sometimes elapses before the animals show any marked signs of illness. In the case of pigs it is sometimes over a month, and it appears to be occasionally the same in regard to sheep, calves, turkeys, ducks and geese. Anyone not conversant with this might readily come to the conclusion that the pig was insusceptible to plague and get rid of it before the sickness had time to develop. This long period, not of incubation, because if the animal's temperature is carefully taken its system will be observed to be out of order, but of absence of visible signs of disease, is important in relation to the interval which elapses between cases of plague in endemic centres. It is probably one of the bridges of many which connect the intervals common in these regions between the attacks in man. In this connection it may be remarked that the descriptions of the mode of life of the inhabitants in the endemic centres of plague in Persia, India and China, are alike in representing the very intimate association of the animals and poultry and the people in their houses, each and all living together generally in the same dark and unventilated hut. Now that such animals and poultry are known to be susceptible to plague, that the symptoms are ill-defined, and that the illness may be of more or less chronic type and thus be unrecognisable except to those who are looking for it, the endemicity in these regions becomes more explainable. It may also be that the virulence and type of the disease is connected more or less with the passage of the plague organisms through these animals.

Domestic animals and monkeys take plague by feeding.

23. The remaining subject for consideration is the comparative ease with which the animals and birds experimented on took the infection by the mouth and alimentary canal. The facility of this mode of infection raises a much wider question, namely, whether plague is not more frequently acquired by swallowing infected food, solid or liquid, than has hitherto been thought to be

the case. When it is found that such differently constituted animals as monkeys, pigs, calves, sheep, rats, hens, ducks, turkeys, geese and pigeons contract plague by feeding on food which has previously been infected, it is difficult to suppose, though it is possible, that man is not likely to be infected in the same way. It is important that this avenue of infection should be guarded, and that henceforth in all preventive measures against plague, precautions to prevent the bringing into the markets of infected food should be taken. The monkey is the nearest approach to man of the animals experimented on, and though one of the feeding experiments was unsuccessful, the other, viz., smearing a banana with the blood of a rat that had died of plague, caused the death of the monkey from plague in six days. Taken in conjunction with the recorded experiment of Staff-Surgeon Wilm, in which a monkey that chewed and sucked a piece of sugar cane infected with a pure culture of the bacillus died in five days, the experiment leaves no doubt as to the susceptibility of the monkey contracting plague in this way. There are no recorded instances, so far as I am aware, of plague in man being caused by infected food, if Dr. Graves' statement of his having known it to be caused by diseased chickens be excepted; but I take it that this has been rather due to enquiry in this direction not being pursued owing to the preponderating influence of assigning most of the cases to inoculation. In China, where pork is the chief article of a meat diet, the fact that pigs are subject to plague is of great importance, and has always to be borne in mind when dealing preventively with the disease. The part that the plague-infected rat plays in the spread of the disease to man is not unlikely to be due in many instances at least to the infection of food stuffs, solid and liquid, the examination of the intestinal contents, urine, and mucus of the mouth of infected rats showing plague bacilli in a certain proportion.

The significance of this in regard to the animals by which man becomes infected.

It would be a very rare occasion, even in China, for an infected rat to be eaten, though curiously enough Dr. Paton, of Chin-chiew in Fukien, refers to a man who was believed to have contracted plague by having eaten a rat which had fallen from the rafters in a dazed condition. The rat was cooked before being eaten.

34. Having settled the question as to whether other animals besides rats suffer from plague in the affirmative, it is necessary to state that other epizootics prevail in Southern China, and that even though pigs and oxen are dying in a village where plague is prevailing, it need not be from plague. During my short stay in Hongkong I was able by the assistance of Dr. Gibson, the veterinary surgeon, to examine cases of anthrax in cattle, pig typhoid in pigs, and an enteritic and glandular disease of an infectious character in cows, which is in some respects similar to rinderpest, and evidently due to a minute diplococcus. I had no time to enter fully into an investigation of this disease, my chief concern being to determine whether it was plague or not, but its frequent prevalence and fatality demand a searching investigation into its causes and prevention. I should recommend facilities being given to Dr. Hunter and Dr. Gibson to that end.

Other epizootics besides plague prevail among pigs and oxen in Southern China.

In Hongkong there is one large dairy farm in which Australian and English milch cows are kept. The farm was established in 1889, and since

1896 the animals have suffered more or less from an epizootic which has proved very fatal. It has always appeared during the plague season. The late veterinary surgeon came to the conclusion that it was rinderpest, and introduced the practice of inoculation as a preventative, and the use of blood serum from animals recovered from the disease as a curative for the sick.

On May 16th, 1902, Veterinary-Surgeon Gibson asked me to visit the farm with him, as an outbreak of this annually recurring disease had once more taken place, and he was anxious to know what the nature of the disease was and whether it was rinderpest. Taking with us Dr. William Hunter, the bacteriologist to the Colony, the three of us made a careful examination of the affected animals, and came to the conclusion, first, that the outbreak at the dairy was not plague; secondly, that it was not rinderpest; and thirdly, that it was a systemic disease manifesting itself mainly in the intestinal tract and causing at times a hæmorrhagic condition of the lymphatic glands. The causal agent is apparently a minute diplococcus to be found in the organs of the body and in the urine and excreta, and probably infecting the fodder. The outbreak was confined to one shed, and on the 16th of May, fifteen out of nineteen of the animals were ill. Two of the four which remained well had the disease the previous year; eleven of the fifteen were observed not to be well on the 13th of May, and on taking their temperatures they were found to be high, varying from 104° to 107° F. The next day the remaining four showed signs of illness.

The general symptoms were high temperature, rapid breathing, rapid emaciation and severe diarrhoea, the stools varying in colour, some containing large quantities of blood, others being only slightly blood-stained. There was no eruption or excoriation of the gums, no intense inflammation or redness of the buccal mucous membrane, no very profuse running at the eyes or nose, although in some there was a slight appearance of this symptom, and there was no very great congestion of the eyes.

From the history of the outbreak most of the cows appear to have been taken ill about the same time. No new animals had been brought to the shed for many months past, but grass and fodder had been recently obtained from the outside. The water supply to the farm was good.

Four cows were examined. The post-mortem appearances of the four cows were similar. The respiratory tract was healthy, mouth, tongue, larynx, trachea and lungs were normal, so was the upper digestive tract, but the disease seems to have expended its force on the fourth stomach or abomaseum, on the large intestine, on the cæcum, and on the small intestine, each of which was intensely inflamed, contained hæmorrhagic extravasations, sometimes in small, at in other times in large patches, and was the seat of ulcers varying in size from a pin's point to that of a sixpenny piece. Along the small intestine there were groups of ulcers which sometimes extended for four or five inches along the mucous membrane on the side opposite to the intestinal attachment to the mesentery. The next most characteristic appearance was the congested and hæmorrhagic condition of nearly all the lymphatic glands of the body. Some of the smaller lymphatic glands were so much congested as to be quite black. The larger lymphatics varied in their appearance, but on section nearly all were darker than usual and showed hæmorrhagic infarcts.

The other organs of the body, though congested, showed no particular change from the normal. In fact the disease seemed to be essentially one of the intestinal tract and of the lymphatic glandular system.

In order to ascertain whether the disease was due to a micro-organism, microscopical specimens were made of the blood, bile, intestinal contents, and the pulp of the lungs, liver, kidney, spleen and lymphatic glands, and inoculations into nutrient agar were made at the same time. Examination of the specimens showed in all more or less, but more particularly in the glands, a micro-organism of a minute size and of a coccoid shape frequently joined as diplococci with a capsule. The cultures were not very satisfactory, the small diplococcus being mixed with other organisms. A guinea-pig inoculated with the blood of one of the animals died in twenty-four hours, having in its organs and blood a pure culture of the small diplococcus.

As already stated this disease requires to be further investigated in order that its causes, mode of spread, and method of prevention may be ascertained.

PART IV.

REMEDIAL MEASURES.

Plague epidemics costly to the Government and to the mercantile community.

1. The annual expenditure of the Government of Hongkong in its endeavour to limit the outbreak of plague by no means represents the financial burden which the Colony has to bear on account of these annual outbreaks. It actually forms a very small part compared with the loss incurred by the shipping community by every vessel being placed in quarantine at different ports of call, or by the emigration agents when, owing to plague in Hongkong, emigration is suddenly stopped; nor are these the only ways in which the plague affects the mercantile community. As soon as plague becomes in the slightest degree severe, there is always the risk of a large percentage of the coolies in different firms leaving suddenly and going to their homes in China, thus seriously paralysing business and interfering with trade activities.

Causes of plague in Hongkong external and internal.

2. The causes of the continuance of plague are external and internal to the Colony, and remedial measures, to be effective, should deal with both. The relative importance of the external cause varies at different times. From June to December it may be treated as of no consequence, while from January to June it may or may not be of the utmost importance. The latter will depend on the prevalence or absence of plague in the districts of Southern China, with which Hongkong is commercially connected, or in those from which a large contingent of emigrants come, or from which the floating inhabitants of Hongkong are drawn, and which at the Chinese New Year and the Tombs festival are especially liable to bring infection with them on their return to the Colony.

Protection of the Colony from external causes has to be based on information from infected districts.

4. It is requisite for the Government of Hongkong to be in possession of information as to the existence of plague in those parts of China with which the Colony is most intimately connected, commercially and socially, in order that the ordinary measures of precaution may be taken against importation of the disease.

Protective measures should consist of supervision of junk and steamer traffic with infected centres.

5. This protection may be afforded, not by quarantine, which is ineffective and a costly disturbance to trade, but by a supervision at the most dangerous period of the year over the junks and steamers trading with infected districts, and insisting on the large steamers, native and European, which carry hundreds of passengers daily to and fro between Canton and Hongkong, and between Macao and Hongkong, having a surgeon on board at the companies' expense to report those that are sick with plague and other infectious diseases, the alternative being a medical inspection before the steamer communicates with the shore, a mode of procedure which causes much delay and inconvenience, and should be avoided if possible. There is no need of making formal declarations that certain

parts of China are infected. The supervision should form one of the ordinary routine duties of the sanitary organization, guided by the intelligence received in *weekly bulletins* from different centres.

As the Chinese Government is not one of the signatory powers to the Venice Convention, notification of plague in China is not made to foreign Governments. It is accordingly not in this direction that the Government of Hongkong can acquire the necessary information. It might, however, do so by other means and obtain even more valuable information than that which is possible for a Government to supply which has no health organization such as exists in the countries represented at the Venice Conference. I would suggest in so important an affair as this, if it can be arranged with the English Foreign Office, that the medical officer of the English Consulates in different parts, or the Consul himself, might submit a *weekly bulletin* as to the infected towns or villages in his district in Southern China. In places where no Consul is stationed, arrangements might be made with some of the leading medical missionaries for a similar bulletin, and it might also be possible, with the concurrence of Sir Robert Hart and the Chinese authorities, for a *weekly bulletin* on this subject to be sent by the medical officers of the Customs of the different districts.

Information thus obtained would be invaluable, and would allow the sanitary authority of the Colony to act with precision and effectiveness.

6. By the Venice Convention protection is sought to be obtained by medical inspection of the passengers and crew of every vessel coming from an infected port, by taking the names and addresses of the passengers, and by subjecting them at their homes to medical surveillance for a period of ten days. The combination of measures is excellent, and well adapted for the conditions existing in Europe, but it is not suitable for Hongkong. The Chinaman has a number of names any one of which he may use, which renders identification extremely difficult, while there is to be added the confusion arising from wrong addresses knowingly or unknowingly given, and the very large number of persons to deal with daily. By ten days' time the surveillance would become impracticable and useless. Similarly any attempt to quarantine for ten days persons coming from infected districts would be utterly impracticable. But though neither medical surveillance nor quarantine is feasible in Hongkong, yet it is not advisable to dispense with all precautions having for their object the protection of the Colony from the importation of plague. Thousands of immigrants coming from infected localities arrive in the Colony, and are permitted to take up their residence without any precaution to screen out those that may be infected. The same may be said of other passengers coming from Canton and its neighbourhood, the West River and delta, and other infected centres in the provinces not far from Hongkong. These dangers require to be met.

The recommendations of Venice Convention not adapted to the conditions of Hongkong.

7. In a memorandum dated March 20th, I suggested to the Government of Hongkong the following:—

Measures recommended to be adopted.

“A modified system of inspection should, I think, however be introduced during the first months of the year. Ships and junks coming from the Chinese coast, more particularly those coming from districts in which

plague is known to exist even in the slightest degree, should be boarded by boarding officers previous to their admission to the harbour, to ascertain if there is sickness of any kind on board; and if there is the slightest suspicion of sickness, whether supposed to be infectious or not, and there is no medical man on board, the ship or junk should be visited by one of the medical officers assigned to the port for that purpose. Such medical officers, and in fact all the Port Health Officers, should be part of the Sanitary Department, and should report direct to the Medical Officer of Health. Hongkong has no Custom House Officers who could have performed this duty. I am, however, informed by the Harbour Master that three or four boarding officers would be sufficient for the purpose. I am further of opinion that the Canton steamers—native and European—should, during the first six months of the year, carry at their companies' own expense a medical man, who might be a Chinese graduate, educated at the Hongkong College of Medicine for Chinese, to examine the Chinese passengers *en route* and report to the boarding officers. All ocean and river steamers with surgeons on board should, on certificate of surgeon countersigned by the captain as to freedom of ship from infectious disease then and on the voyage, be allowed to pass without any medical inspection, even if from an infected port. The Health Officer of the Port should, however, possess discretionary power.

"These arrangements are quite different from placing passengers and ships from infected districts under observation at a quarantine station, and they do not attempt medical surveillance once a passenger has landed. They are simply a rough screen against actual or suspected cases. The system is neither surveillance nor quarantine, and it would not be followed by either of these. The sick or suspicious only would be dealt with, and taken to hospital or to the isolation station for observation; all others would be freely passed and without delay, greater care being taken with those boats coming from districts in which it is known by the bulletins suggested that plague exists.

"Special measures should also be taken for the systematic destruction of rats on incoming steamers and junks from infected ports or the Chinese coasts and which go to the wharves or into the docks. The junks and steamers anchoring in mid-stream need not be dealt with, nor need ships in transit, provided the precautions referred to in my previous memorandum for the prevention of rats coming on shore from the ships and boats which are moored to the shore are rigorously and properly enforced."

It is not in regard to plague alone that the Colony is exposed to outside infection. In the annual report for 1896, Dr. Clark, Medical Officer of Health, points out that exclusive of plague 50 per cent. of the cases of infectious disease in the Colony in that year were imported by the shipping, few having been detected until after they had come under the care of a resident practitioner. Every year similar instances can be cited.

It will be gathered from this statement that the measures taken, if any, are not sufficient to prevent importation of disease, and that in consequence the Colony is subjected to much risk of being attacked by outbreaks of infectious disease, and to a considerable cost in dealing with these outbreaks when they occur.

8. The system of medical inspection now in vogue is not protective. The Health Officer of the Port is only called upon to inspect a vessel or make inquiries as to the health of those on board when it comes from an infected port which has been declared by the Government of Hongkong and published in the *Gazette* to be an infected port, which is likely to be a very tardy mode of procedure; or when a vessel arrives which has on board sickness which is believed to be of an infectious nature. A declaration of this kind, involving after all only medical inspection of the ships and no quarantine of the vessel, but a detention at the most of a few hours, in the event of illness being on board, is misunderstood in other ports, and is apt to be followed by the imposition of quarantine on the ships from the port which has been declared infected as well as on all ships from Hongkong. The two measures will bear no comparison. Medical inspection deals with the sick or those suspected to be sick on board, and the delay caused by this and the disinfection of the ship if necessary is counted by hours, and in the event of no sickness by less, whereas quarantine deals with the ship whether infected or not, and the delay is counted by days. Ten days is placed as the maximum by the Venice Convention, and those that have not agreed to the terms of the Venice Convention may fix any period they may think fit. In the one case the inconvenience to the shipping is very slight, while in the other it amounts to a serious hindrance to trade and great financial loss to shipping.

Medical inspection as now carried out not protective to the Colony.

With regard to the arrival of vessels with sickness on board which is infectious, the disease will be reported when the vessel carries a surgeon, but in the case of ships with no surgeon it is not likely to be reported, an omission which may be due to design or ignorance, but which it is often impossible to determine. Whether from the one or the other is immaterial so far as the result is concerned, for the mischief is done before the facts come to the knowledge of the authorities, as there is no boarding of the vessel, and no inquiry as to its health conditions or the occurrence of sickness on board during the voyage, until after the vessel has communicated with the shore and its passengers have landed and dispersed. It will thus be seen, that, apart from plague, the system by which the Colony is supposed to be protected from outside disease is far from satisfactory. The machinery, moreover, by which the health work of the port, such as it is, is carried on is also unsatisfactory in that the two medical officers are in private practice, which may be an excellent arrangement for a small port, but not for one the size of Hongkong, which is not much behind London as regards the number of vessels and amount of tonnage that are entered and cleared.

An alternative proposal to that of the appointment of two whole-time Health Officers for the Port, and three or four boarding officers, who, as there are no Custom House Officers, might be police officers attached to the Sanitary Department, is Dr. Clark's, viz., one Health Officer of the Port with three assistant medical officers. It is immaterial which is adopted as long as the work which has to be done is efficiently and quickly carried out. Whatever arrangement is decided on, it is essential that the officers should form part of the Sanitary Department of the Colony and should communicate direct with the Sanitary Office.

Food supplies
should be
inspected.

9. These officers would at the same time keep a supervision over the food supply which is being brought into the Colony in junks, especially with reference to slaughtered pigs and other animals.

That an inspection of certain food supplies coming into Hongkong is probably needed may be surmised from the fact that in June, 1902, it was reported from a reliable source that dead pigs were being sent in a junk to Hongkong for sale, and, though a close watch was kept by the police on shore, the dead pigs were not discovered.

The experiments showing the susceptibility of pigs and poultry to plague point to the advisability of inspection, whilst observations in the slaughterhouse as to the existence of disease in some of the animals slaughtered emphasise the importance of a careful examination of everything suspicious not only in the ordinary manner but also by the microscope. For this purpose there should be attached to the animal depot a small laboratory for the use of the veterinary surgeon. More elaborate investigations could always be referred to the bacteriologist of the Colony.

Special
attention
should be
paid to
emigrant
houses.

10. In addition to the inspection of immigrants I would advise that emigration be regulated as it is elsewhere ; and, with this in view, arrangements should be made that the emigrant houses are known, registered, and kept under special control ; that they are inspected daily ; that their sanitary condition as regards cleanliness, superficial area, cubic space, sunlight, and ventilation is thoroughly looked after ; that a proper register of the names of the inmates is kept by the emigrant house keeper ; and that the state of health of every emigrant in the Colony is also known ; and this can only be obtained by regular medical inspection of the emigrants in the emigrant houses and immediate compulsory notification of all sickness, whether infectious or not, by the emigrant house keeper.

Remedial
measures
suggested for
internal
causes of
plague.

11. Coming to the internal causes, it is impossible to remove, except gradually, the structurally insanitary houses which have been described and which promote the continuance of plague, but it is not impossible to at once appoint a staff which shall be exclusively engaged in dealing with plague in the human being or in rats, and which shall pay special attention to the removal of those conditions known to be directly connected with the spread of plague. By this means the disease can be kept within moderate limits, and both panic and disturbance of trade be prevented.

A specially
trained
plague staff
required.

12. The first remedial measure which it is advisable to adopt is the employment of a small but specially organized staff, well trained to deal with plague, and not to be dependent on a supply of untrained men hurriedly collected, who are practically useless, and accordingly very costly.

A small but special Plague Department under the control and direction of the Medical Officer of Health has sufficient duties to perform to keep it fully occupied, both during the plague season, and in the autumn and winter, when there is little or no plague.

As stated in my memorandum of March 20th, the plague work should be independent of the ordinary sanitary routine work of the day, and therefore

requires a special establishment which can work in conjunction with the Sanitary Department and get the benefit of its assistance. But the two should not be amalgamated to that degree that one set of duties are lost in the other. The Director and executive head of both should be the Medical Officer of Health for the Colony. His time must not, however, be occupied with clerical work, which should be relegated to a capable head clerk, or, if necessary, several clerks working in his office. I would recommend that the *weekly bulletins* received by the Government, and all official documents relating to the health of the Colony or to outbreaks of disease in other countries, should be sent direct to the Medical Officer of Health; while official documents relating purely to administrative work should be addressed to the administrative president of the Sanitary Board.

13. The duties of the special Plague Department, summarised, are :—

Duties of the
plague staff.

(1.) The discovery, location, and microscopical examination of plague cases, whether—

(a.) Rat plague.

(b.) Human plague.

(2.) The tracing out the history of the human plague and the connection with others, if any, of each case, and the following out the course of rat plague.

(3.) The removal and disinfection of clothes, &c. If no person were permitted during the plague season to remove furniture from any house without a certificate granted by the Police or Sanitary Department, a check would be placed on the wholesale removal of infected clothing and furniture which now takes place from one house to another.

(4.) The examination of contacts and disinfection of the contacts' effects.

(5.) The vacating of buildings.

(6.) The special destruction of rats and the cleansing of infected buildings.

(7.) The seeing that infected buildings and adjoining buildings are made rat-proof, and that air and light are admitted into these buildings. Much good work can, in many instances, be done by windows so situated as to let light and air into the room. It is necessary to make the houses rat-proof, for no sooner is one house cleansed on account of infected rats than another in the vicinity has to be cleansed because infected rats are found in it, and so the process goes on. There is a continual cropping up in different houses in the same block of rats which are infected. The cleansing and pouring of carbolic acid down the rat run has only a temporary effect on the house, and can have no permanent preventive effect in regard to recurrences later on in that house, or in checking the migration of rats through their burrows in floor and walls from house to house, while there are rat runs communi-

cating from house to house. New houses are, for this reason, usually exempt from plague. It is in the footings of the walls that the rat runs and communication from house to house are usually to be found. The filling up of the rat runs in the footings with glass and cement, and a 3 or 4 inch layer of cement on and at the sides of the footings and on the floor, are necessary to render the ground floor safe.

(8.) The careful supervision as regard cleanliness and freedom from rats of the houses provided by Government for people removed from any block of buildings.

(9.) The boarding of vessels when required, and inspection of sick persons.

(10.) The establishment of an isolation station for the observation of any sick persons coming by boat from an infected district.

(11.) The inspection of the quays and reporting to the Harbour Master any relaxation or infringement of the regulations relating to precautions in the harbour to prevent rats from coming on shore.

(12.) The general destruction of rats in godowns and elsewhere. For this purpose several of Clayton's machines for pumping gas would be useful. The distribution of rat poison in the storm water channels, houses, stores, quays, &c.; the superintendence of the work of the rat-catchers; the preparation of cultures of *Danysz bacillus* and its distribution.

(13.) The special destruction of rats in infected areas. One important observation stands out prominently in these investigations. It is that, whether in the towns and villages of China or in Hongkong itself, rat plague precedes human plague, and from this observation the preventive measure is obvious, viz., whenever and wherever rat plague occurs it is important to deal at once with the infection, and not to wait until a number of human plague cases has occurred. The principle involved is to be in front of human plague. Rat plague is not only a sign that human plague will sooner or later occur, but it is so intimately connected with human plague that if the rat plague is dealt with effectively human plague will not occur to any great extent.

(14.) Preventive inoculation with Haffkine's prophylactic.

(15.) The careful inspection and examination of the conditions of pigs and poultry which are being brought from infected districts as advised by the weekly bulletins.

(16.) The keeping of the necessary registers and notices, also bulletins received from Southern China, and the issuing of the weekly reports.

Duties of
plague staff
distinct from
ordinary
duties of

14. These duties, it will be seen, are distinct from the ordinary routine of the Sanitary Department, which is occupied chiefly in matters relating to the scavenging and conservancy of the City of Victoria, the villages, and Kowloon;

to the abatement of nuisances, &c.; to the drainage of houses; and to the dealing with cases of small-pox, cholera, diphtheria, and other infectious diseases. It is only the latter duties that could be combined with those of plague prevention.

Sanitary
Department
as now
constituted.

Neither do the duties in any way touch the larger sanitary questions of the Colony, such as the distribution of the water-supply and its purity, as apart from the constructive work, the maintenance of the sewerage and its flushing arrangements, the laying out of streets, public [and private, projecting new streets and scavenging lanes, improving the line of old streets, the reservation of open spaces, the construction of healthy houses, the space to be left in and about buildings to secure free circulation of air, the reservation of land for public purposes, and the provision of markets, baths and wash-houses for men and women, and of public and private latrines and urinals. Nor do they include the abolition of cubicles without windows nor the larger questions relating to insanitary property. There are areas, such as No. 5 district, in which nothing short of acquiring the property, compensating the owners, and demolishing and reconstructing, can improve the sanitary conditions, and there are others in which the conditions can be gradually improved. There is also the very important duty of preventing what is actually even now taking place, of insanitary areas springing up in the town; and of blocks of buildings being erected to contain hundreds of inmates without the owner of the buildings being obliged to provide for each house a latrine in the backyard, and for every block a public latrine with a proportional number of seats to the number of inmates the block is likely to contain.

15. These sanitary duties, which are now more or less carried out by different and independent officers, are not co-ordinated under the Head of a department, and do not and cannot under present arrangements receive the attention which they absolutely require, and it is obvious that a Sanitary Board, meeting infrequently and having a President who, as it happens, is particularly well fitted for the position, but who is not expected to devote his whole time to the duties or even the greater portion of his time, who has no administrative or executive powers other than carrying out the decisions of the Board in meeting, and who is not on the Executive Council of the Government, cannot give that continuous and detailed attention to the sanitary requirements which the rapidly growing City of Victoria on one side of the harbour, and the town of Kowloon on the other, demand.

Absence of
co-ordination
of all sanitary
duties under
one adminis-
trative head.

16. The result is that notwithstanding the efforts of the Government since 1894, and the excellent work done by Dr. Clark, the Medical Officer of Health of the Colony, whose sanitary duties are both administrative and executive, a combination which is too onerous when plague also has to be dealt with, the housing in Hongkong according to Mr. Chadwick is no better but rather worse than it was twenty years ago, when he first visited Hongkong, while in sanitary matters generally it is evident that there is an absence of a continuously progressive, prospective, and controlling policy, culminating in scarcity of water and the general unsatisfactory condition of municipal matters referred to in this report. All constructive work is excellent and worthy of the Colony, whether it relates to water-supply, sewerage, roads on the hill-side, the slaughter house or animal

Result of
want of
centraliza-
tion.

depôt, while the general scavenging of the streets is the best in the East, and is remarkably good considering the conditions under which it has to be carried out.

All health matters should be centralized in one Public Health Department administered by a Sanitary Commissioner.

17. With a full recognition of these good works, there still remains the fact that the existing arrangements are inadequate for the sanitary requirements of the Colony. All matters relating to sanitation should be centralized and dealt with by one department, viz., a Public Health Department, which should be administered by an officer who should devote the whole of his time to such duties, and who should be ex-officio chairman of the board and head of the department. This officer, whose functions would be that of a Sanitary Commissioner, should be a medical man specially trained and skilled in sanitary affairs and responsible to the Government for the efficient administration of the department, just as the Director of Public Works is responsible for his.

The new Ordinance is intended to deal with the housing question of Hongkong.

18. As regards the housing question in Hongkong, it has been fully dealt with by Mr. Chadwick and me in our report of May 14th, 1900, a copy of which is appended. The bill which was drafted by us with the assistance of Dr. Clark, at the request of the Government of Hongkong, includes, among other Public Health measures, the necessary alterations in the law to secure reduction of over-crowding of people and of crowding together of houses; the dealing with insanitary property and houses unfit for habitation; the removal of windowless cubicles; and the prevention of the construction of insanitary houses and of the formation of insanitary areas. In connection with the treatment of unhealthy areas it may be stated that the Portuguese Government in Macao has obtained excellent results by the demolition of some of the worst plague-infected areas and by rebuilding on sanitary lines.

It may be observed that as most of the land in Hongkong has been leased out by the Crown for 999 years, and is frequently changing hands as a matter of speculation, any restriction of the enactment to property recently leased by the Crown would, as it has done in former Ordinances, paralyse sanitary reform, and should be carefully avoided. It is highly important, also, that those growing parts of the Colony which have been only sparsely built upon, such as Kowloon and its suburbs, should be planned out with streets of proper width and with scavenging lanes, and that each house built should have provided at its rear a suitably sized backyard independent of the scavenging lane, and no block of houses should be permitted to be built without the builder providing sufficient latrine and urinal accommodation for the male occupants of the block, and there should be attached to such latrines arrangements for washing and disinfecting the utensils of the house used by the women and children.

Suggestions as to the manner in which removal of infected clothes may be dealt with.

19. Other causes favouring the continuance of plague are the dumping of dead bodies into the street and the surreptitious removal of clothing and furniture from an infected house to a healthy one. In the one case the house and in the other the articles of clothing escape cleansing and disinfection, and are liable to retain the infection. Both are very difficult to deal with, but the removal of infected articles might be checked by not permitting any furniture, &c., to be removed from a house in the plague season without a written permit

from the Police or Sanitary Office, while the dumping would be lessened or the authors discovered by a well-organized Plague Department systematically and promptly tracing out the circumstances connected with cases of plague. The systematic examination of rats would point out the quarters to be specially watched, as it will mark out the infected district or districts.

The distribution of handbills in Chinese among householders, merchants, storehouse keepers, employers of labour, junk owners, and others, explaining the causes and symptoms of plague, the dangers connected with it, the importance of notification of sickness to the Sanitary Department in order to prevent the disease spreading, and the ordinary measures of prevention, would assist in dispelling the present ignorance on the subject, and would likely have a more or less beneficial result.

20. Outside the Sanitary Department and in the domain of hospital administration, which is ably and admirably controlled by the Principal Medical Officer of the Colony, is the Government Infectious Hospital, to which plague patients are sent for treatment. This hospital was not originally built for the purpose for which it is now used, and is consequently deficient, in many respects, in the accommodation necessary for such institutions, even though it has been supplemented by a number of excellent mat-sheds and also by the Hospital Ship, the "Hygeia."

Suggestions
as to
improvements
required
in the
Government
Infectious
Hospital.

It was provided rather for an emergency than as a permanent infectious hospital. There are no detached and suitable observation wards in which a patient suffering from fever of a suspicious character can be isolated with absolutely safety, and with separate attendance, until it is determined whether the disease is plague or not. A patient of this kind cannot be placed in a plague ward, or even in the plague hospital block. Without suitable and properly situated observation wards in connection with the hospital, the isolation of suspicious cases, or of cases which it is considered necessary to isolate for a certain period, and which may have been taken from board ship or from shore, is very much handicapped if not rendered impossible. There is also no proper accommodation for nurses. If a nurse is required for a female plague or small-pox patient, she has to be taken from the General Hospital, and is subjected to much inconvenience if she has to remain, as it is most desirable she should, in the Infectious Hospital, for nursing plague patients, and at the same time residing in a general hospital could not be countenanced. There are also no special quarters outside the hospital block for the ward masters or for the resident physicians, one of whom should always be on the premises. There are, moreover, no separate blocks for small-pox or for cholera, and it is quite possible, as happened in 1902, that small-pox, cholera, and plague may be prevalent at the same time.

It is necessary in a well-arranged infectious hospital that separate buildings be provided for each of these diseases, both for Europeans and Chinese. In the near future the accommodation for Chinese suffering from infectious disease will be materially improved by the new Tungwa Hospital, which is being built on modern principles, close to the Infectious Hospital. The new Tungwa Hospital will meet a distinct want, but it is advisable that the Government Infectious Hospital should also be re-modelled as soon as

possible. The existing building would do well for the accommodation of the staff and as the administrative block of an enlarged and more modern hospital, with extensive observation wards in a convenient but well-isolated position.

Suggestions
as to the
provision of
an isolation or
observation
station for
coolie
emigrants.

21. In connection with the Emigration Service, which is a service of crowds of coolies, there should be an observation station, for with such large numbers of emigrants, amounting to over 100,000 yearly, returning to Hongkong from different foreign ports, it must occasionally happen that the ship arrives infected. Many of the ships bring 900 and sometimes over 1,000 at one time. The Health Officer of the Port instanced the necessity of an observation station in the case of the "Theangchew," which arrived from Singapore in 1901, and which on arrival was found to be infected with cholera. The patients were sent to hospital, but owing to there being no observation station the other passengers had to be accommodated in junks while the ship was being cleansed and disinfected, an arrangement which was most unsatisfactory, as the passengers were exposed to the inclemency of the weather, and there could be no proper sanitary arrangements for them. Moreover, as it was advisable, under the circumstances, to keep them several days under observation, men, women, and children were mixed up in the junks, which in a few days became most insanitary. There is nothing to prevent a similar occurrence in the future unless special provision is made beforehand for these contingencies.

There is at Kap-si-mun, on the small island of Mawan, the old custom house, which has come into the possession of the Hongkong Government since the recent addition of new territory. It is admirably situated and, with a few alterations, well adapted for an isolation or observation station, and it is accordingly recommended to be fitted and used for that purpose.

Conclusion.

22. In conclusion it may be stated that the remedial measures depend on what is known of plague, modified by the local conditions.

In this report it is shown :—

I. That the whole of Southern China is more or less infected with plague.

II. That the proximity of Hongkong to such an extensively infected area brings with it considerable risk of infection, and that that risk is increased by the fact that the population of Hongkong largely belongs to the Province of Kwantung, that Hongkong is largely dependent on this province for its food supply, and that Hongkong is the chief commercial centre for this part of China.

III. That plague is endemic in Hongkong quite apart from any possible re-infection.

IV. That the endemicity in Hongkong is mainly dependent on the following :—

(1.) Infection among rats.

(2.) Infection of the soil in rat-holes.

(3.) Insanitary condition of the interior of the house, especially in relation to the cubicle system and the darkness, dampness, and bad ventilation of rooms, and overcrowding, with its attendant insanitary evils.

(4.) Infection of clothes of people who have died of plague and whose articles of clothing have been removed before disinfection.

(5.) The practice of dumping dead bodies in the street and thus effectually concealing the infected houses.

The remedial measures as regards external causes consist in controlling as far as possible the avenues by which infection is introduced into the Colony. For this control it is necessary for the Government to be regularly informed as to where plague exists, but even with this information it has to be recognised that, with the southern coast of China in the condition described, Hongkong is continually subjected to the risk of re-infection, and that no amount of precaution which is within the bounds of practicability can do more than lessen that risk so long as China takes no action.

In regard to internal causes the remedies lie in the creation of a special plague organization to combat plague, and the centralization of all sanitary matters into a Public Health Department, with a trained medical man skilled in sanitary matters as its administrative chief, who shall be ex-officio President of the Sanitary Board, and who shall be responsible to the Government for the efficient administration of the department.

By these measures an effectual control will be obtained over the outbreaks of plague, and it will be possible to deal gradually but effectively and on a commensurate scale with the numerous problems connected with the housing question and the general insanitary condition of Hongkong which serve to perpetuate the continuance of plague in the Colony.

W. J. SIMPSON, M.D., F.R.C.P.

December 22nd, 1902.

The first of these is the fact that the
the second is the fact that the

The third is the fact that the
the fourth is the fact that the

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The seventh is the fact that the
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The twenty-first is the fact that the
the twenty-second is the fact that the

MAP OF SOUTHERN CHINA

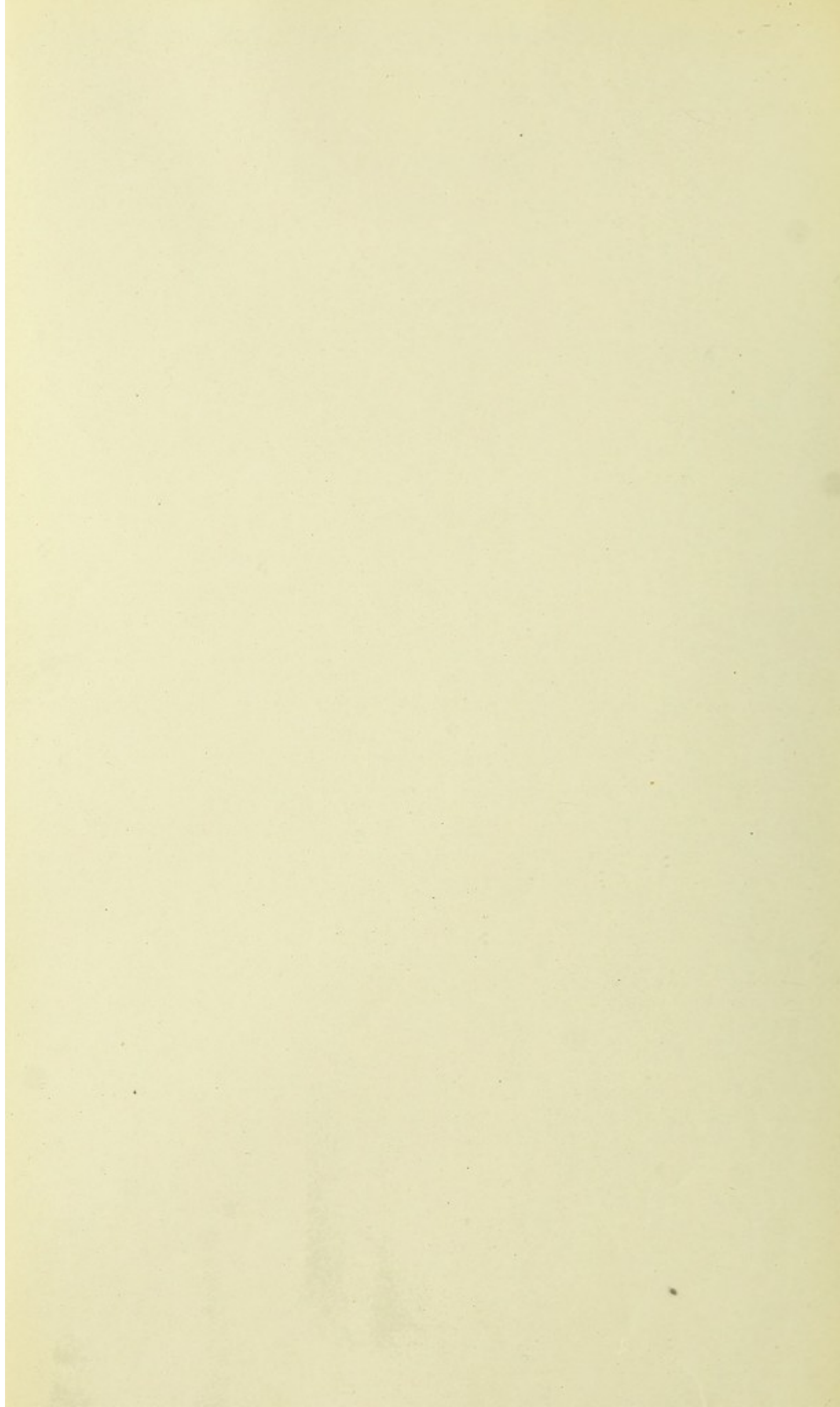
SHOWING THE
PROVINCES OF YUNNAN, KWANGSI, KWANGTUNG AND FUKIEN, WITH RIVERS AND TRADE ROUTES
AND THE LOCALITIES INFECTED WITH PLAGUE.

RED LINE INDICATES TRADE ROUTES.

RED CIRCLE INDICATES LOCALITIES INFECTED BEFORE THE OUTBREAK IN CANTON IN THE SPRING OF 1924.

RED SQUARE INDICATES LOCALITIES INFECTED AFTER THE OUTBREAK IN CANTON IN 1924 SOUTH AND EAST OF CANTON.
THE PLAGUE INFECTED LOCALITIES WEST OF CANTON AND NOT MARKED
INDICATE INFECTED LOCALITIES IN 1924 IN WHICH LOCALITY WAS FIRST NOTICED BY PLAGUE
WENT IN LOCALITY IN SPRING OF 1924, BUT PLAGUE UNRECORDED.





APPENDICES.

A.—Notes sur la peste au *Yunnan*, by Mons. E. Rocher.

B.—Notes on the route followed by Mr. Grosvenor's mission through *Western Yunnan* from *Talifu* to *T'eng-Yueh*.

C.—Notes on an epidemic disease observed at *Pakhoi* in 1882, by Dr. Lowry.

D.—Notes on the first plague epidemic at *Changpu, Fukien, South China*, by Dr. J. Preston Maxwell.

E.—Memorandum on Plague in *Yunnan*, by Mons. E. Rocher.

F.—Answers to questions on plague by Medical Men residing in *Southern China*.

G.—Tabular statement of monthly emigration from *Hongkong*.

H.—Report on the question of the Housing of the population of *Hongkong*, by Osbert Chadwick, M. Inst. C.E., M.I.M.E., C.M.G., and W. J. Simpson, M.D., F.R.C.P.

K.—Some details of rooms in *Hongkong* and the rent paid for them.

Appendices A, B, C, D, F, and H, are printed and bound in a separate volume.

APPENDIX E.

MEMORANDUM ON PLAGUE IN YUNNAN BY MONS. E. ROCHER.

From researches made on the spot since I published my book on Yunnan, ⁽¹⁾ 1881, it appears that plague began to be known in 1840, but long before that time the disease had made victims on the western part of the province without affecting an epidemic character.

The Chinese doctors of the time in their ignorance took it for granted that it was pestilential miasma (Tchang chi).

1. When I first arrived in Yunnan in 1870 the whole country was in rebellion and partly infected with plague. I remember having seen scores of families mowed down by the disease, and even villages where half of the inhabitants had succumbed and the other half had deserted their homes to encamp on the top of the hills where the disease never reached.

I have tried over and over again to find out the origin of the disease and how it appeared in Yunnan, and I must confess that the information I got on the subject was contradictory and indefinite. But there is a point on which nearly all agree, that is, that it was imported from the west (Burmah). I never heard that plague was endemic in Burmah, and from investigations I made, it appears it was imported on the west of Yunnan by Mussulman pilgrims returning from the Holy Land.

2. During my first stay in that province until 1891, plague was very virulent, and from that time it gradually lost its virulence. I never noticed that the Chinese inhabitants or aborigines suffered from glandular swellings unless when attacked by the disease.

3. I have not noticed in the Chinese records, which I compiled from the beginning of an era, that the country has sustained an epidemic. In fact the country is so large and the means of information so difficult that an epidemic disease might have occurred in a particular spot without touching the littoral of the seas or the principal centres. On the other hand, the means of communication between Europe and China were then so slow that I do not think that there was any connection between the disease of the two continents.

4. From my experience during many years that I was in Yunnan I never noticed that the floods, droughts, or irregular seasons had anything to do with plague. It made its appearance in a regular way during the time of the plantation of rice, that is to say, about May, and I noticed it was very virulent in places where it appeared for the first time.

5. There is another point to which I think it necessary to draw your attention :

During the Yunnan rebellion, and especially from 1863 to 1880, the disease was very virulent on the central plateau of the province between 1,700 to 2,300 metres of altitude. On the other hand, it never reached the banks of the river at an altitude of 450 to 600 metres, so people living at low and high altitudes were quite free of it; that explains why the inhabitants of the central plateau were taking refuge on the high plateau during the epidemic season.

These facts, which I noticed several years running, gradually disappeared, the plague becoming acclimatised to low and high altitudes.

As it was to be feared that either the Canton River by Paise, and the Red River by Manghao and Laokay would soon become infected by the disease, I reported the matter to the Colonial authorities. I do not know what steps were taken, but in 1892 the inhabitants of Manghao, on the banks of the Red River, reported that plague had made its appearance, and soon afterwards the same news came from Paise, from which place it descended to Pakhoi and Canton.

I was again in Yunnan in 1895 as Director of the Lyons Commercial Mission, and from enquiries then made I found that the disease, though endemic in certain towns, and chiefly in the southern part of the province, was less virulent, and a good many of the patients recovered.

E. ROCHER.

LIVERPOOL,

5th January, 1900.

⁽¹⁾ "La province Chinoise du Yunnan," par E. Rocher, 2 vol. E. Leroux, Editeur, Paris.

APPENDIX G.

EMIGRATION FROM HONGKONG FROM JANUARY, 1888, TO FEBRUARY, 1902.

Month.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
January ...	6,751	3,831	1,263	3,352	2,079	6,141	4,723	2,934	5,306	3,530	1,963	5,756	6,383	7,247	4,634
February ...	3,169	1,828	2,355	809	1,846	2,217	1,400	4,919	1,501	1,800	3,893	2,312	3,570	1,469	1,509
March ...	11,558	6,175	5,139	3,485	6,154	10,583	9,334	10,532	14,242	6,887	5,945	6,846	18,373	8,690	—
April ...	12,820	6,161	5,466	6,362	7,271	15,594	9,961	9,645	19,559	8,183	7,401	10,379	14,451	11,857	—
May ...	17,593	5,745	5,074	6,400	6,312	10,884	*4,831	8,320	19,927	7,572	4,576	9,314	11,979	10,499	—
June ...	11,000	4,081	3,142	4,263	4,403	8,629	*28	5,430	16,250	6,365	5,019	11,360	12,279	1976	—
July ...	8,802	3,424	4,556	3,872	4,121	6,093	*28	5,452	15,719	5,441	7,673	11,197	11,056	1565	—
August ...	7,078	3,358	2,579	2,662	3,392	3,928	*157	4,853	4,211	4,498	4,154	11,510	2,058	3,147	—
September ...	3,895	3,034	3,543	3,572	3,741	4,976	2,086	5,621	7,050	5,611	4,648	1889	5,776	6,860	—
October ...	4,814	3,785	2,884	4,578	3,705	4,220	6,191	5,391	5,344	4,905	5,079	5,012	5,919	7,012	—
November ...	4,536	2,927	2,571	2,297	4,721	4,361	6,028	5,097	3,807	3,616	4,347	9,119	6,400	6,175	—
December ...	4,179	3,500	3,194	3,505	4,398	4,710	4,284	4,944	3,906	4,423	5,134	7,381	5,399	5,277	—
Total ...	96,195	47,849	42,066	45,162	52,143	82,336	49,023	73,138	66,822	62,831	60,432	61,075	83,613	69,774	—

* Plague.

† Quarantine at Singapore.

‡ Suspended at S.S.

HARBOUR DEPARTMENT,

HONGKONG, 21st March, 1902.

RUMSEY,

Harbour Master, &c.

APPENDIX K.

SOME DETAILS OF ROOMS AND THE RENTS PAID.

House	...	...	...	No. 8, Square Street.
Floor	...	...	...	Ground.
Occupied as	...	...	...	Common lodging house.
Tenant	...	...	...	Female, sells machines.
Rent of floor	...	...	...	\$30 per month.
Number of inmates	...	...	...	21, mostly hawkers.
Number of cubicles	...	...	...	None.
Number of bunks...	...	...	...	—

PARTICULARS.—The tenant says she has been here for 15 months, and that a year ago her rent was raised from \$25 to \$30 a month. She produced her receipt for the last payment but could not find a receipt a year old.

Each of the lodgers pays \$1.30 per mensum for his lodging.

House	...	...	...	8, Square Street.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Female, widow.
Rent of floor	...	...	...	\$23 per mensum.
Number of inmates	...	...	...	18.
Number of cubicles	...	...	...	5.
Number of bunks...	...	...	...	3.

PARTICULARS OF CUBICLES.

No. 1—				
Rent	...	...	...	\$3.60.
Tenanted by	...	...	...	1 man and 1 wife.
Wages	...	...	...	Man earns about \$10.0.
Occupation	...	...	...	Hawker.
No. 2—				
Rent	...	...	...	\$3.30.
Tenanted by	...	...	...	1 man, 1 wife and 1 child.
Wages	...	...	...	Said to earn \$8 to \$10 a month.
Occupation	...	...	...	Fish seller.
No. 3—				
Rent	...	...	...	\$3.
Tenanted by	...	...	...	1 man and 1 wife.
Wages	...	...	...	Not given, variable.
Occupation	...	...	...	Clothing hawker.
No. 4—				
Rent	...	...	...	\$3.
Tenanted by	...	...	...	1 man, 1 wife and 1 child.
Wages	...	...	...	\$8.10 per mensum.
Occupation	...	...	...	Man is a carrying coolie.
No. 5—				
Rent	...	...	...	\$3.10.
Tenanted by	...	...	...	1 man, 1 wife and 1 child.
Wages	...	...	...	Not given.
Occupation	...	...	...	Man is a vegetable hawker.

The front part of the room, *i.e.*, between the first cubicle and the front wall, is occupied by the landlady alone.

There is one bunk outside front cubicle which is let at \$1 a month to a fish seller, who is said to earn \$4 to \$6 a month. There are also three bunks at back end of room outside the cubicles let to fakis in fish stalls at \$1 a month.

House	...	...	...	14, Square Street.
Floor	...	...	...	Ground.
Occupied as	...	...	...	Joss paper shop.
Tenant	...	...	...	Shopkeeper.
Rent of floor	...	...	...	\$30, 12 months ago \$21, receipt seen.
Number of inmates	...	...	...	—
Number of cubicles	...	...	...	None.
Number of bunks...	...	...	...	None.
House	...	...	...	14, Square Street.
Floor	...	...	...	First floor.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Ex-sailor.
Rent of floor	...	...	...	\$23, receipt not forthcoming.
Number of inmates	...	...	...	12 at time of visit.
Number of cubicles	...	...	...	6.
Number of bunks...	...	...	...	4, 3 at rear half of room and 1 in front.

PARTICULARS OF CUBICLES.

No. 1—				
Rent	...	...	...	\$6, including one bunk outside.
Tenanted by	...	...	...	2 women and 1 child.
Occupation	...	...	...	One woman's husband employed in Canton steamer.
Wages	...	...	...	\$18 per mensem.
No. 2—				
Rent	...	...	...	\$3.60, when let. Empty at time of visit.
No. 3	...	...	...	Also empty at visit, rent usually \$3.30.
No. 4—				
Rent	...	...	...	\$3.30.
Tenanted by	...	...	...	1 man and 1 wife.
Occupation	...	...	...	Pork-seller in Western Market.
Wages	...	...	...	Man earns \$10 a month, wife earns \$1 to \$1.50 a month by sewing.
No. 5—				
Rent	...	...	...	—
Tenanted by	...	...	...	Tenant of floor and his wife.
Occupation	...	...	...	Ex-sailor.
Wages	...	...	...	—
No. 6—				
Rent	...	...	...	\$3.80.
Tenanted by	...	...	...	1 man and 1 wife.
Occupation	...	...	...	Man is ship's cook, wife sews.
Wages	...	...	...	Man earns \$12 per month, wife \$1.50.

There are three bunks at back part of the room which are let at \$1.20 per month. The tenant's son sleeps in one of them.

House	...	...	...	14, Square Street.
Floor	...	...	...	Second floor.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Female, here for three years.
Rent of floor	...	...	...	\$23, receipt produced.
Number of inmates	...	...	...	13.
Number of cubicles	...	...	...	5.
Number of bunks...	...	...	...	1.

PARTICULARS OF CUBICLES.

No. 1—				
Rent	...	...	...	\$5.30 with 1 outside bunk.
Tenanted by	...	...	...	2 women and 1 boy.
Occupation	...	...	...	Husband of one is a sailor, and
Wages	...	...	...	Earns \$12 a month.

No. 2—				
Rent	...	...	...	\$3.80 per month.
Tenanted by	...	...	...	1 man, 1 wife and 2 children.
Occupation	...	...	...	Man is a house broker.
Wages	...	...	...	Earns \$12 to \$20 per month.
No. 3—				
Rent	...	...	...	\$3.60 per month.
Tenanted by	...	...	...	1 man and 1 wife.
Occupation	...	...	...	Man is Chinese constable, and
Wages	...	...	...	Earns \$9 per month.
No. 4—				
Rent	...	...	...	\$5 per month.
Tenanted by	...	...	...	1 man and 1 wife.
Occupation	...	...	...	Foki in drug store.
Wages	...	...	...	\$20 per month.
No. 5—				
Rent	...	...	...
Tenanted by	...	...	...	Tenant of floor.
Occupation	...	...	...	None.
Wages	...	...	...	None.

There is one bunk at back of room and occupied by daughter of tenant of floor. This tenant says she has been here three years.

House	...	...	...	14, Square Street.
Floor	...	...	...	Third.
Occupied as	...	...	...	Common lodging house.
Tenants	...	...	...	Common.
Rent of floor	...	...	...	\$23.0.
Number of inmates	...	...	...	19 (painters).
Number of cubicles	...	...	...	9.
Number of bunks...	...	...	...	9 (trestle beds for 19 men).

These men say they have been here for 10 months, and that when they came their rent was \$21. The receipts were not forthcoming. 14 Square Street.

House	...	...	...	16, Square Street.
Floor	...	...	...	Ground.
Occupied as	...	...	...	Tenement house.
Rent of floor	...	...	...	\$27 per month.
Number of inmates	...	...	...
Number of cubicles	...	...	...	9.
Number of bunks...	...	...	...

House	...	...	...	16, Square Street.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Rent of floor	...	...	...	\$23.
Number of inmates	...	...	...	13.
Number of cubicles	...	...	...	6.
Number of bunks...	...	...	...	3.

The tenant of floor, a female, says she has been here for five years, and that at that time the rent was \$15.5.

PARTICULARS OF CUBICLES.

No. 1—				
Rent	...	...	...
Tenanted by	...	...	...	Tenant of floor.
Occupation	...	...	...	None (husband is foki in a grocer's shop).
Wages	...	...	...	\$10.

No. 2—				
Rent	...	...	...	\$4.
Tenanted by	...	...	...	Old widow.
Occupation	...	...	...	None.
Wages	...	...	...	None.
No. 3—				
Rent	...	...	...	\$4 per month.
Tenanted by	...	...	...	One woman.
Occupation	...	...	...	Waitress in brothel.
Wages	...	...	...
No. 4—				
Rent	...	...	...	\$ per month.
Tenanted by	...	...	...	1 woman, 1 boy, 1 girl.
Occupation	...	...	...	Beggars, woman and girl blind.
No. 5—				
Rent	...	...	...	\$4.
Tenanted by	...	...	...	3 blind women.
Occupation	...	...	...	Beggars.
No. 6—				
Rent	...	...	...	\$4.
Tenanted by	...	...	...	1 man and 1 woman.
Occupation	...	...	...	Beggars.

A bunk in front part of room is used by the landlady's daughter.
There are two bunks at back part of room, one of which is let at \$1.10 per month to a blind man (street-singer-beggar), the other is empty.

House	...	...	...	20, Aberdeen Street.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Widow, husband was farmer in Lan Moon.
Rent of floor	...	...	...	\$23.
Number of inmates	...	...	...	12.
Number of cubicles	...	...	...	6.
Number of bunks	...	...	...	2.

PARTICULARS OF CUBICLES.

No. 1—				
Rent	...	...	...	\$6.10 per month.
Tenanted by	...	...	...	1 woman and 1 daughter.
Occupation	...	...	...	Husband skipper of S.s. "Tai On" (Canton boat).
Wages	...	...	...	Not known.
No. 2—				
Rent	...	...	...	\$4.10 per month.
Tenanted by	...	...	...	1 man, 1 wife, and 3 children.
Occupation	...	...	...	Printer in <i>China Mail</i> Office.
Wages	...	...	...	\$22.
No. 3—				
Rent	...	...	...	\$3.70 per month.
Tenanted by	...	...	...	1 woman.
Occupation	...	...	...	Husband is cook in S.s. "Olympia."
Wages	...	...	...	Not known.
No. 4—				
Rent	...	...	...	\$3.70 per month.
Tenanted by	...	...	...	1 man (Portuguese).
Occupation	...	...	...	Printer in <i>China Mail</i> Office.
Wages	...	...	...	Not known.
No. 5—				
Rent	...	...	...	\$4.80 per month.
Tenanted by	...	...	...	2 women.
Occupation	...	...	...	Husband sailor.
Wages	...	...	...	Not known.

This rent includes the space in front end of room without the No. 1 cubicle. Such space is used by renter as a sitting room.

No. 6—

Rent	...	...	...	...
Occupied by	...	...	...	Tenant of floor.
Occupation	...	...	...	Widow.
Wages	...	...	...	...

There are two bunks at back part of room not now let but used by tenant of floor.
Ground floor is a Silversmith's shop let at \$26 per month.

House	...	...	...	30, Aberdeen Street.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Female (husband is builder).
Rent of floor	...	...	...	\$18.5.
Number of inmates	...	...	...	7 usually.
Number of cubicles	...	...	...	5.
Number of bunks...	...	...	...	None.

PARTICULARS OF CUBICLES.

No. 1—

Rent	...	...	...	\$5 per month.
Tenanted by	...	...	...	1 woman and 1 child.
Occupation	...	...	...	Husband is ship's steward.
Wages	...	...	...	Unknown.

No. 2—

Rent	...	...	...	—
Tenanted by	...	...	...	Tenant of floor and child.
Occupation	...	...	...	Husband builder.
Wages	...	...	...	\$15 per month.

No. 3—

Rent	...	...	...	\$3.
Tenanted by	...	...	...	1 woman.
Occupation	...	...	...	Nil.
Wages	...	...	...	Gets \$10 from husband in California, who sells tobacco.

No. 4 ... Empty now, rent usually \$3 per month.

No. 5—

Rent	...	...	...	\$3.50.
Tenanted by	...	...	...	1 man and 1 wife.
Occupation	...	...	...	Man is cook on a ship.
Wages	...	...	...	Not known.

The front part of this floor, about 10 feet in depth from the front wall, is used as a common sitting room for the tenants on the floor.

The ground floor of this house is occupied as a common lodging house by chair coolies.

Rent	...	...	...	—
Landlords	...	...	...	Linstead and Davis.
House	...	...	...	13, Elgin Street.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Female (husband is cook).
Rent of floor	...	...	...	\$22 per month.
Number of inmates	...	...	...	14.
Number of cubicles	...	...	...	5.
Number of bunks...	...	...	...	2.

PARTICULARS OF CUBICLES.

No. 1—

Rent	...	...	...	\$5.50 per month.
Tenanted by	...	...	...	1 man, 1 wife and 1 child
Occupation	...	...	...	Husband is a foki.
Wages	...	...	...	\$8 (?).

No. 2—
 Rent \$3.80 per month, not paid.
 Occupied by 1 man, 1 wife and 1 child.
 Occupation Foreman in dock-yard.
 Wages \$10 per month.
 Occupier is son of tenant of floor and pays no rent.

No. 3—
 Rent \$3.50 per month.
 Tenanted by 1 man and 1 woman.
 Occupation Ship's cook.
 Wages \$8 per month.

No. 4—
 Rent \$3.50 per month.
 Tenanted by 1 man, 1 woman, 1 child.
 Occupation Ship's market compradore.
 Wages Variable (unknown).

No. 5—
 Rent \$5 per month.
 Tenanted by 1 man, 1 woman.
 Occupation Market compradore.
 Wages Variable earnings.

There is a bunk between first cubicle and front windows used in day only. (?) There is also a bunk at back of room used by a woman.

The ground floor of this house is used as a common lodging house by 21 chair coolies. The rent is \$25 per month. Each man pays $\frac{25}{21}$ parts of a dollar as his share of the rent.

House	...	...	...	45, Queen's Road East.
Floor	...	...	...	First.
Occupied as	...	...	...	Tenement house.
Tenant	...	...	...	Tailor, works on premises.
Rent of floor	...	...	...	\$13.50.
Number of inmates	...	...	...	8.
Number of cubicles	...	...	...	4.
Number of bunks...	...	...	...	Nil.

PARTICULARS OF CUBICLES.

No. 1—
 Rent \$3 per month (?)
 Tenanted by Tenant of floor, wife and 2 children.
 Occupation Tailor.
 Wages Variable.

No. 2—
 Rent \$3.
 Tenanted by 1 man and 1 small boy.
 Occupation Tailor.
 Wages \$8.10.

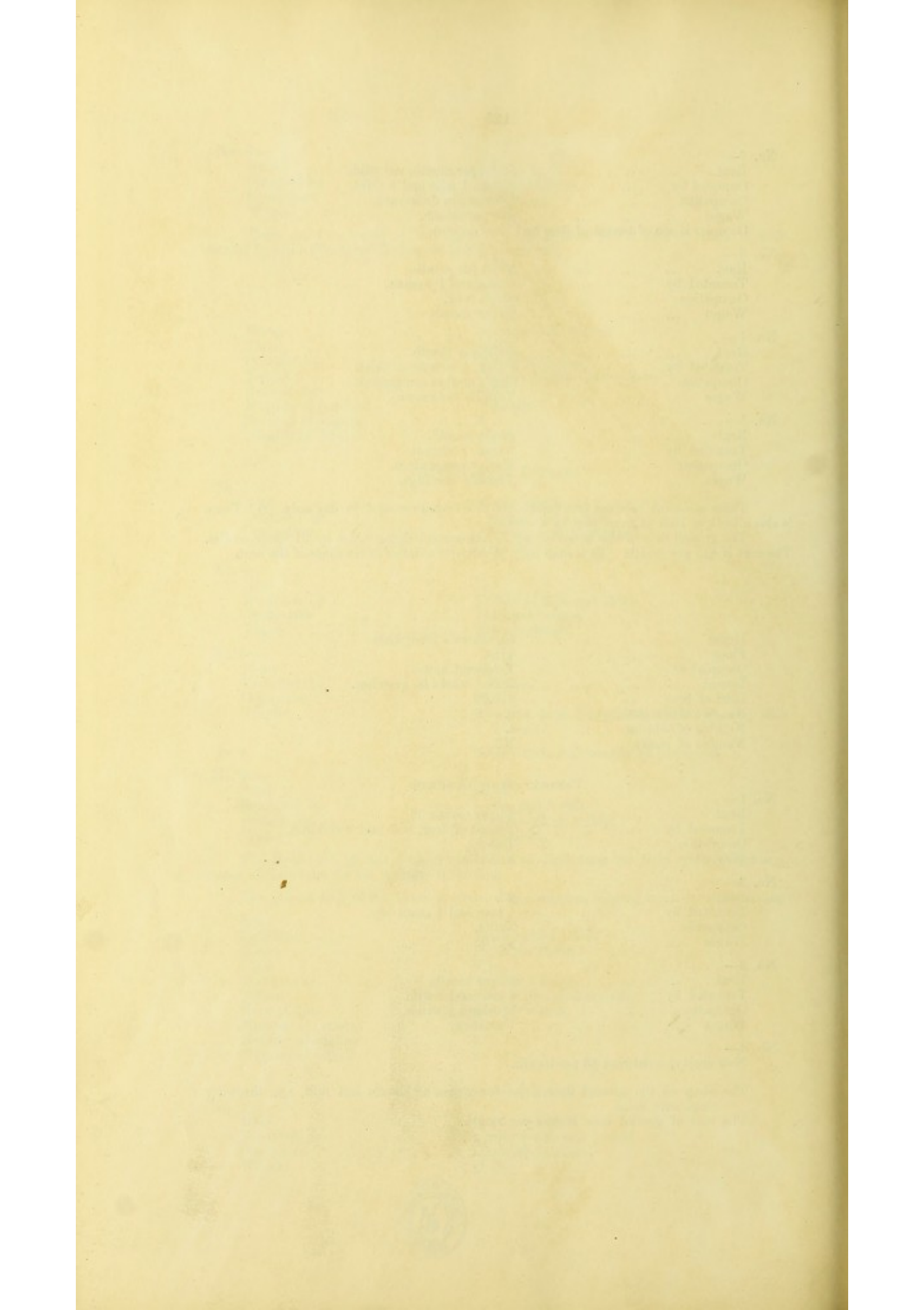
No. 3—
 Rent \$3 per month.
 Tenanted by 1 man and 1 wife.
 Occupation Working jeweller.
 Wages Unknown.

No. 4—
 Now empty, usual rent \$3 per month.

The shop on the ground floor is let for games of chance and skill, *e.g.*, throwing rings over coins.

The rent of ground floor is \$30 per month.





Appendices to the Report
ON THE
CAUSES AND CONTINUANCE
OF
PLAGUE IN HONGKONG.

BY
W. J. SIMPSON, M.D., F.R.C.P.

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Appendices to the Report

by

GEORGE AND CONSTANCE

PLAQUE IN HONGKONG

by

W. J. SIMPSON, M.D., F.R.C.P.

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APPENDIX A.

NOTES SUR LA PESTE AU YÜN-NAN.*

LA PROVINCE CHINOISE.

DU

YÜN-NAN

PAR

ÉMILE ROCHER. Deuxième Partie, page 279.

La maladie connue au Yün-nan sous le nom de *yang-tzü* (痒子), et qui paraît n'être autre que la peste bubonique, y fait chaque année de nombreuses victimes ; elle sévit aussi quelquefois dans le Laos et sur la frontière du Kuei-chou.

D'après les renseignements que nous avons pu obtenir parmi les notables, cette maladie semble venir de la Birmanie, d'où elle est transmise par les caravanes qui trafiquent entre les deux pays. On n'est pas d'accord sur l'époque de son apparition dans le Yün-nan : les uns disent (et la plus grande partie de la population est de cet avis) que le centre et l'est de la province n'ont connu le fléau qu'au début de la rébellion ; d'autres prétendent qu'il s'est montré dans l'extrême ouest jusqu'à Ta-li-fu, quelques années auparavant. En supposant que cette dernière hypothèse soit vraie, l'épidémie a dû passer bien légèrement dans ces parages, puisqu'on n'en a pas eu connaissance dans les autres districts.

Depuis le commencement de la guerre civile, cette terrible maladie s'est déchaînée avec fureur sur la province et continue, encore aujourd'hui que la province est paisible, à y exercer ses ravages.

Ce qui ferait croire que cette épidémie n'est due qu'aux miasmes mal-faisants qui s'exhalent de la terre, c'est que les petits animaux qui vivent dans les égouts ou sous la terre sont atteints les premiers, les rats par exemple. Dès qu'ils se sentent malades, ils sortent par bandes, font irruption dans l'intérieur des maisons, courent affolés, et, après quelques tours sur eux-mêmes, tombent morts ; le plus souvent ils crèvent sous les planchers, ce qui détermine dans les appartements des odeurs infectes, dont on ne découvre que trop tard la cause. Le même phénomène se produit chez tous les autres animaux, grands et petits : les buffles, les bœufs, les moutons et les chèvres sont frappés du même mal, et parfois aussi les oiseaux de basse-cour, mais, parmi ces derniers, la maladie fait moins de victimes. A notre arrivée dans la province, nous refusions d'ajouter foi aux nombreux témoignages des indigènes, en les mettant sur le compte de leur imagination troublée ou de leurs idées superstitieuses ; mais quand l'épidémie éclata dans le district même où nous nous trouvions, il nous fut facile de nous convaincre de leur véracité.

Dès que ces symptômes avant-coureurs se manifestent, la population ne tarde pas à être attaquée à son tour. On prend alors les précautions estimées le plus efficaces pour se garantir du fléau. Presque partout, afin de purifier les maisons, on allume du feu dans toutes les chambres, et dans certains districts on cesse de manger du porc.

* Nous résumons ici nos observations sur la peste, dont nous avons déjà parlé, notamment pp. 75, 76, de la première partie. Ainsi condensées, ces notes faciliteront les recherches de ceux que concerne cette question spéciale.

Chez l'homme, la maladie s'annonce par une fièvre violente, accompagnée d'une soif intense ; quelques heures après, une tumeur d'un rouge foncé commence à paraître aux aisselles, à l'aîne ou au cou ; la fièvre s'accroît de plus en plus, et le malade ne tarde pas à perdre connaissance. La tumeur grossit d'habitude jusqu'au second jour et reste ensuite stationnaire. A partir de ce moment, le malade paraît reprendre ses sens, mais il est encore en grand danger ; car, si la tumeur, jusqu'alors très dure, devient molle et si la fièvre ne diminue pas, il est considéré comme perdu ; dans le cas contraire, si la tumeur perce en dehors, ce qui arrive rarement, il y a espoir de le sauver ; mais, arrivé à ce point, le malade est si affaibli que, bien que la tumeur ait abouti, il meurt d'épuisement.

Quelques médecins chinois ont essayé d'inciser ces tumeurs ; mais, soit que l'opération ait été mal faite ou trop tardivement, bien peu de malades y survivent ; quand ils sont à bout de ressources, ils ont recours au musc qu'ils ordonnent à la dernière extrémité et à fortes doses.

Pendant notre séjour au Yün-nan, nous avons vu un grand nombre de cas, et nous devons dire que la plupart ont eu un dénouement funeste. Dans les endroits où la peste ne fait que passer, on peut estimer que le nombre de ses victimes est environ de 4 à 6 pour 100 ; tandis que dans d'autres districts, plus rudement éprouvés, la population est complètement décimée, et des familles entières disparaissent les unes après les autres. Dans les parages où l'épidémie sévit avec tant de violence, les habitants n'hésitent pas à abandonner leurs demeures et leurs récoltes sur pied pour aller camper sur les hauteurs où, bien souvent, le fléau les poursuit.

Ce qui, à notre avis, contribue beaucoup à aggraver cette déplorable situation, c'est que les Chinois, superstitieux comme ils le sont, au lieu d'enterrer les pestiférés, se contentent de les placer dans des bières qu'ils exposent au soleil, soit sur la pente des collines ou en plein champ. Ils s'ensuit que les gens qui voyagent ou circulent dans les environs des villages empestés sont à peu près asphyxiés par les odeurs nauséabondes que répandent les cadavres en décomposition.

Pendant les années 1871, 1872 et 1873, nous avons remarqué que le début de l'épidémie se manifeste toujours au commencement de la plantation du riz, c'est-à-dire de mai à juin ; après cette époque, elle sévit avec vigueur dans les localités qu'elle traverse. Durant l'été, que est, au Yün-nan, la saison des pluies, elle continue de se propager avec moins d'activité ; toutefois, c'est pour reprendre une intensité nouvelle à l'époque de la moisson, et c'est à partir de ce moment jusqu'à la fin de l'année, qu'elle fait le plus de victimes.

Un fait étrange, que nous avons observé dans plusieurs endroits au midi et au nord de la province, c'est que l'épidémie, au lieu d'englober tous les lieux habités, villes et villages, qui se trouvent sur sa route, passe à côté sans y toucher, les franchit même, et revient quelques mois après, ou l'année suivante, frapper l'endroit oublié. Voici un autre fait, non moins curieux que le précédent : après s'être déclarée dans presque tous les villages dispersés dans les plaines, l'épidémie éclate sur les montagnes où elle produit de nombreux ravages parmi les aborigènes. D'après ce que nous avons vu par nous-même et la façon irrégulière dont la maladie se présente, elle paraît importée sur les hauteurs par les hommes ou femmes qui vont, à certaines époques de l'année, travailler dans les plaines. C'est surtout, comme nous l'avons dit plus haut, après la plantation du riz ou quand la récolte est terminée que le fléau quitte le pays bas pour aller sévir sur les hauteurs.

L'esquisse, montrant la marche suivie par la maladie pendant les années 1871, 1872 et 1873, a été dressée d'après des notes officielles fournies par les fonctionnaires des lieux pestiférés et d'après nos propres renseignements.

APPENDIX B.

NOTES ON THE ROUTE FOLLOWED BY MR. GROSVENOR'S MISSION
THROUGH WESTERN YÜNNAN. FROM TALI-FU TO TÊNG-YUEH.

REPRINTED FROM THE PARLIAMENTARY REPORT, CHINA No. 3 (1878).

ROYAL GEOGRAPHICAL SOCIETY.

SUPPLEMENTARY PAPERS.

VOL. I—PART I.

1882.

PAGE 178.

Another strange disease which haunts this and some other of the valleys of Yünnan bears, in some respects, a resemblance to the Plague of London described by DEFOE.

Its approach is indicated by the eruption of one or more minute red pustules, generally in the arm-pits, but occasionally in other glandular region. If several pustules appear, the disease is not considered so hopeless as when there are few. The sufferer is soon seized with extreme weakness, followed in a few hours by agonising aches in every part of the body; delirium shortly ensues, and in nine cases out of ten the result is fatal.

It often happens that the patient suddenly, to all appearance, recovers, leaves his bed, and affirms that, beyond a slight sensation of weakness, he feels thoroughly convalescent. This is invariably a fatal sign; in about two hours the aches return, and the sufferer dies.

True recovery is always very gradual. This is the account given us by a French missionary, who has spent half a lifetime in Yünnan. The native version includes all the above facts, but involves them in a cloud of superstitious accessories; for instance, all parts of the sick-room are occupied by devils; even the tables and mattresses writhe about and utter voices, and offer intelligible replies to any one who questions them.

Few, however, venture into the chamber. The missionary assured me that the patient is, in most cases, deserted like a leper, for fear of contagion. If an elder member of the family is attacked, the best attention he receives is to be placed in a solitary room, with a vessel of water by his side. The door is secured, and a pole laid near it, with which twice a day the anxious relatives, cautiously peeping in, poke and prod the sick person, to discover if he retains any symptoms of life.

Père FENOUIL (there is no objection to his name being mentioned) had himself witnessed many cases of the disease, and lived in infected towns. He attributes his own safety to the precautions he took of fumigating his premises and keeping charcoal braziers constantly burning, to such an extent, indeed, that his house on one occasion actually took fire. He states that not only human beings, but domestic animals, and even rats, are attacked by the pestilence.

Its approach may often be known from the extraordinary movements of rats, who leave their holes and crevices, and issue on to the floors without a trace of their accustomed timidity, springing continually upwards from their hind legs as if they were trying to jump out of something. The rats fall dead, and then comes the turn of the poultry; after the poultry have succumbed, pigs, goats, ponies and oxen successively die off.

The good Father has a theory of his own that the plague is really a pestilential emanation slowly rising in an equable stratum from the ground, and as it increases in depth, all animals are, as it were, drowned in its poisonous flood—the smaller creatures being first engulfed, and man, the tallest of Yünnan animals, suffering last.

The Christian converts suffer less than their pagan countrymen, from the superior cleanliness which, as we were informed, their faith inculcates.

We ourselves never saw any cases of plague; but we met one native of South-Western China, no less a personage than the Governor of the Yünnan Province, T'sÉN, a quiet, sober-spoken veteran of a hundred battles, deeply marked between the eyes with a scar inflicted by a rebel bullet. He had undergone two attacks; the second was less violent than the first. He remembered nothing of the acute period of the illness, but in both cases his recovery was gradual and protracted.

He attributed it to the influence of demons; and we afterwards heard a characteristic instance of his faith in his own diagnosis. The headquarters of his division during the Mohammedan rebellion were situated in a plague-stricken town, and when the infection began to attack his troops, T'sÉN had all the gates closed except that in the southern wall, and then sent in his soldiers with orders to slash and pierce the air in every corner that could possibly harbour a demon. After this preliminary slaughter, the men were formed in line against the inside of the north wall, and gradually advanced upon the south gate, hemming in the invisible fiends, and ultimately driving them with a final rush through the gate, which was immediately closed, and a strong guard placed outside. But somehow or other the goblins contrived to regain the interior of the city; by what means has not been ascertained, but it is surmised that they climbed over the wall.

We have now some explanation of the evil repute borne by this valley; it is certainly pestilential. The river was, until a late period, the boundary of China, as is indicated by the existence of the "old city" on its opposite bank. Border regions, "debatable grounds," are notoriously the birth-places of myths and marvels. We relegate these lone recesses to the future explorer.

On a post in the village were nailed the ears of a thief. Those dead ears seemed a fit symbol of the deathly silence which reigns over the plague-stricken hollow.

With a sense of relief we began to climb the Kao-li-kung range by an interminable series of steep, but well-paved zig-zags, which brought us, weary and feverish, to the hamlet of Ho-mu-shu (120 miles), 3,000 feet above the valley. Near this we found repose in a tumble-down temple.

APPENDIX C.

NOTES ON AN EPIDEMIC DISEASE OBSERVED AT PAKHOI IN 1882.

By J. H. LOWRY, L.R.C.P.Ed., L.R.C.S.Ed.

Imperial Maritime Customs Medical Reports, China, for the half-year ended 30th September, 1882. 24th June, 1883.

DURING last spring I had an opportunity of observing an outbreak of a very fatal disease which prevailed among the natives of this district. This disease is known locally as *luen-tzũ* (瘰子); and after seeing a number of cases, I have been able to come to no other conclusion than that the disease is at least closely allied to bubonic plague. Little, I believe, had been observed of this malady in China until Mr. ROCHER, of the Customs Service, published, in his *Province chinoise du Yünnan*, the description of a disease resembling plague, which he observed while travelling in that province. The disease which Mr. ROCHER saw was undoubtedly plague,—locally called *yang-tzũ* (痒子). He tells us that during the years 1871-73 its ravages were great through Yünnan; he also learned that the disease was imported from Burma, but there appears to be no reliable information as to the exact date of its introduction. There is, however, sufficient evidence that it has existed in the province since the Rebellion. Mr. ROCHER speaks of the mortality among the rats, they being first attacked; buffaloes, oxen, sheep, deer, pigs, and dogs also suffered,—the latter, he says, less severely. The symptoms in man are slight fever, rapidly increasing; intense thirst; then dark red swellings show themselves in the armpits, groins or neck; fever continuing to increase, patient becomes unconscious; bubo increasing till second day, after which remains stationary; when full size, about as large as a hen's or goose's egg; then consciousness returns, but still great danger, for if the swelling up to this point has been hard, and becomes soft, the fever continuing, the case is considered hopeless. If the tumour open externally there is a chance of recovery. Some Chinese physicians have attempted to cut these tumours, but few survived the treatment; as a last resource they give large doses of musk. Such is the information Mr. ROCHER obtained in Yünnan. Subsequently, Mr. BABER, of H.B.M.'s Consular Service, in his *Notes on Route of Mr. Grosvenor's Mission through Western Yünnan*, speaks of plague. He says its approach is indicated by the eruption of one or more minute red pustules, generally in the armpits, but occasionally in other glandular regions. If several pustules appear, the disease is not considered so hopeless as when these are few. The sufferer is soon seized with extreme weakness, followed in a few hours by agonising aches in every part of the body; delirium shortly ensues, and in nine cases out of ten the result is fatal. It often happens that the patient suddenly, to all appearance, recovers, leaves his bed, and affirms that, beyond a slight sensation of weakness, he feels thoroughly convalescent. This is invariably a fatal sign; in about two hours the aches return, and the sufferer dies. He also refers to the mortality among rats; and poultry, pigs, goats, ponies, and oxen have died. Mr. BABER seems to have obtained most of his information from a French priest, who being an old resident in the stricken districts, should have ample opportunity of noting the character of the disease, and it is likely his general observations are correct. Mr. BABER was fortunate in meeting a native—Governor TSËN—who had been twice attacked by the disease; his second attack was milder than the first. The disease which appears in this district does not seem to spread any great distance, as I have been unable to find evidence of its existing in any other part of the Kwangtung province nor in the neighbouring province of Kwangsi. The existence or extinction of the disease commonly called plague is of interest not only to epidemiologists, but to the members of every community. In India, I learn, it has not appeared for many years. In Sind its ravages were great from 1815 to 1819; in Marwár, in 1836;

Kumâon, 1846, and again in 1852. There it appeared as a fever of a typhus character, accompanied by external glandular tumours; it was very fatal, death taking place in three or four days. It was not contagious, but infectious; the swellings were in a state of incomplete inflammation and suppuration. In many cases death took place in 24-36 hours; there was little fever or other excitement. It was preceded or accompanied by a great mortality among rats; no other animals were affected. It occurred as high as 10,000 feet above the sea level, and with a low temperature; and again in the villages during May, with a house temperature of 95° F. Recently notices have appeared in the *Lancet* announcing rumoured outbreaks of plague in Persia. It was said to have broken out at a village called So-uj-Bolak when there was 35° of frost; it was also rumoured to have occurred at Yazistan. Dr. ARNAUD, of Teheran, reports its having occurred last spring at Ouzoundéré, not far from the borders of Turkish Armenia, and close to the highway which leads through the defiles of Soleymanie from Turkey into Persia. Out of 524 inhabitants, 259 were attacked, and 155 had died, the duration of the malady being from one to seven days. Dr. ARNAUD calls it, in his report, bubonic plague, and says 37 of the persons who had recovered still had large buboes on their necks and under the armpits, while others were marked with indurated anthrax. The inhabitants of the village had been camped out and isolated, the whole of the houses being razed; and this energetic action had the effect of preventing further spread of the malady. In ZIEMSEN's last volume, some interesting statistics of the Hillah plague of 1876 are given. 1,826 cases were recorded, of which 277 were under 10 years; 617 at 10-20; 432 at 20-30; 292 at 30-40; 123 aged 40 to 50; and 82 at more advanced ages. 889 were males, and 937 females; 865 recovered; 961 died; 710 had groin gland suppurations or swellings; 466, axillary glands swollen; 98, the neck; and 122, glands elsewhere; 36 had carbuncles; 28 had coma; 9, convulsions; 120, petechiæ; 2, epistaxis; 6, hæmoptysis; 27, hæmatemesis; 14, bloody diarrhœa; 2, menorrhagia; 32, bilious vomiting; 16, bilious diarrhœa; and 2, jaundice. The treatment, he says, was only expectant.

The epidemic which I have observed in this district does not seem to be an old disease, as it occurred for the first time about 15 years ago, and since that has occurred at certain intervals, the last severe outbreak being in 1877. I am told, however, that a few cases occur every year, but my short residence has not yet given me an opportunity of verifying this statement.

The outbreak of last spring commenced at the end of March, and continued its ravages with lessening severity till the end of June, when it entirely disappeared; while at Lien-chou, a city distant 12 miles from this, it raged with more or less severity till August. The winter here had been a very dry one, with many strong blows from the north. Towards the middle of March the temperature began to rise, and then, during the first 10 days of April, we had some rain and the atmosphere was laden with moisture; from this on, the temperature gradually rose, and by the end of April we had a day temperature of 85°, and a night one of 76° F. The disease proved to be most fatal and most severe from the middle of April to the middle of May. To form any definite estimate of the mortality is no easy matter, since no official record is kept; but I roughly estimate that between 400 and 500 persons died,—and the population of the town and junk community is put down at 25,000. I make my estimate from what I saw and noted at the time. During the worst weeks of the epidemic, the average deaths were 10 a day. At the commencement of the outbreak the people were almost panic-stricken; many quitted their homes, and sought refuge in the villages away from the town. I can never forget the extreme anxiety shown in the faces of friends of the sick who came to fetch me; how the crowd kept painful silence during the time I held the thermometer in position while taking the body heat, they evidently thinking it had some power of charming the sickness away.

In my Report for the April-September half-year, I made some reference to the insanitary condition of the town; and, perhaps, before treating of the disease under review, it would be better to repeat what I before said concerning the condition of the houses in which the sick were.

To begin with, the streets are in an abominable condition of filth. Not the slightest attempt at cleanliness is tried; animal and vegetable substances lie decomposing on every side, the most noxious gases being constantly given off. The privies are open, and placed, for convenience, in the most frequented parts. The houses themselves are no improvement on the streets, and anyone visiting those of the sick will not soon forget the odour perceived on entering the place. Every house was damp and foul, and along the floors of most of them I found small open gutters, emptying themselves into the street. Into these every household abomination found its way; and as they are seldom cleaned or flooded, it is not surprising there is sickness. The floors are damp, and can be nothing but excrement sodden; under them I found small drains at no distance from the surface, some passing along and emptying into the streets, while the remainder pass under the streets and under the houses on the other side, until they eventually reach the sea. The houses and streets of this town run parallel with each other, the highest street being 20-30 feet above the sea, while the lowest is close to the water's edge; consequently in a dry season, an enormous amount of excrementitious matter lies fermenting under the floors,—and it is only when heavy rain comes that the place gets cleansed. In nearly every house where the disease broke out, the rats had been coming out of their holes and dying on the floors. I took the opportunity of dissecting several of the rats, selecting those that had just died. Opening the chest first, I could find nothing beyond slight congestion of the lungs. In the abdomen, all the organs were congested, the intestines much distended with gas; the stomachs contained nothing but a little sand, and it appeared as if some time had elapsed since food was digested; all were in more or less the same condition. In two the liver appeared enlarged; the blood was dark in colour. Examination under the microscope revealed nothing. No other animals were attacked.

I select 10 from the cases that came under my notice, and in the notes appended it will be seen there is some slight difference in the symptoms of each.

Case I.—A male child, æt. 8, was seen on 19th April; he was lying on the floor of a dark, empty room, which had a damp unhealthy odour. The child, I found on examination, was feverish and restless, and was very thin for a child of his years. At the angle of the left lower jaw I found a roundish swelling, about the size of an ordinary hen's egg. It was hard, and very painful on being touched. There was no fluctuation, and the swelling was movable. On removing the Chinese medicine smeared over it, I could find no discolouration beyond a slight red blush. The whole body I examined carefully, and could find no other enlargements, nor any eruption or petechiæ. Tongue furred, papillæ projecting, slight sordes on lips. Temperature in axilla, 101°.4 F.; pulse weak and thready, child too restless to permit me to count the pulsations. Lower extremities felt cold. 20th April—Patient seen early; little change from previous day, beyond there being a small swelling, about the size of a marble, in front of the left ear, or, more correctly, it was a swelling of the superficial parotid lymphatics. It was hard, but did not appear very painful. Temperature 101°; pulse weak and thready. One motion of bowels since previous visit, just before my arrival; it was of a bright yellow colour, and very fetid odour. Patient seemed drowsy, but became very restless on being touched. He died during the afternoon.

A coolie, æt. 16, who came for me to see this case, took ill on the afternoon of the 20th, and died before morning. I did not see him, but he was said to have had an enlargement in his groin. I noticed he was very much excited about my going to see his master's son, and it is probable he felt sick a day before he gave up. In this house, rats had been coming out of their holes for some time, and dying on the floors almost at once.

Case II.—Another male child, æt. about 10 years, was seen on 19th April; he had only arrived the previous evening from Lien-chou; when he left there he was not complaining of sickness. I found patient lying in his mother's arms, in more or less prostrate condition, with heavy expression and drooping eyelids; at times he appeared to get very restless. On examination, I found in the right groin a hard enlargement, about the size of a large betel-nut. It was very painful on being touched, but there was no fluctuation. The glands on each side of it were somewhat enlarged, and those in the left groin slightly swollen. On the dorsal aspect of the right foot there was a small sore, which patient was said to have had some time. Rest of body examined; no other enlargement; no eruption. Tongue examined with difficulty, as patient kept his jaws tightly clenched; it was covered with dry fur, with papillæ projecting; sordes on lips. Temperature in axilla, 106° ; pulse, 100, fairly strong. There had been two loose motions of bowels, but they were not seen,—said to have had very bad odour; urine high coloured, very little been voided. Has vomited a little several times, and complains of thirst. Patient seen on morning of 20th; no change; seems more prostrate; gets very excited on being touched; complains of pain in the groin. Bowels opened once since last night's visit; vomited twice. Temperature in axilla, $104^{\circ}.4$. Pupils distinctly contracted. Patient died early on the morning of the 21st. Ill 48 hours.

Case III. was a man, æt. 25, who had been sick three days previous to my seeing him. He was in bed, but not suffering from much prostration, as he was able to sit up and move about with the greatest ease. His expression was heavy, and his whole skin was moist and had a very yellow hue. In his left groin there was a small hard swelling, about the size of large betel-nut, very painful on being touched; no fluctuation; glands on either side of swelling enlarged. Glands in right groin hard and enlarged. No other enlargements over body; no eruption. Tongue covered with brown fur; patient has been vomiting a yellow fluid; no diarrhœa; complains of headache and pain in lumbar region. Temperature in axilla, $102^{\circ}.8$; pulse, 100, weak. 22nd April.—Patient's strength seems to keep up, and he imagines himself much better. No change in bubo, still hard and painful; no further enlargements. Bowels opened twice; still complains of lumbar pain; constant running from nose. Temperature $103^{\circ}.8$; pulse, 70, weak. At the nape of the neck I found a rather extensive petechial ecchymosis; this was not visible at previous visit. 23rd April.—Before I saw patient, he was dead. Thinking he was better, he got up and went out, only getting a few steps from his own door, fell down, and expired, probably from syncope.

Case IV. (seen on 22nd April).—A young man, about 20, took ill previous morning, and when I saw him he was in the wildest delirium, and it was with great difficulty I examined him; skin hot and dry; breath foul; has been vomiting; no diarrhœa. Temperature, $104^{\circ}.6$,—probably higher; patient too restless to retain thermometer long; pulse not counted. Whole body examined, and in the right groin I found a diffuse swelling, about the size of a hen's egg; it was softer than previous cases, but I failed to make out fluctuation; it did not appear to cause pain on being touched. Glands of left groin enlarged and hard; no other enlargements over body. 23rd April.—Saw patient early; found him quite quiet; all delirium gone, but he had a haggard, prostrate look.

Temperature $104^{\circ}.8$; pulse small. Skin dry and hot; general sallow hue. Tongue covered with dry fur; sordes on lips. Complaints of headache; vomiting stopped; no diarrhoea. Bubo not greatly changed, the swelling having extended a little above Poupart's ligament, where it appeared hard. Glands of left groin unchanged. Patient died in the afternoon. In this house, on my making the usual inquiry whether anyone else was sick, I learned that a child was just recovering; he, too, had an enlargement in the groin, and eventually got well. Rats died in large numbers in this house.

Case V. (23rd April).—This patient was an older man, æt. about 40, and had been sick four days. There was no evident prostration, and he was sitting up in the bed quite steadily. Patient stated that his sickness came on with a shivering fit, and he afterwards felt hot, and then noticed a swelling in the groin; he complains of headache and pain in the groin, and at times feels very cold; there has been no diarrhoea or vomiting. Expression heavy; skin very sallow. In the left groin there was a hard circumscribed swelling, not larger in size than a good betel-nut, very painful on being touched; no discolouration or sign of suppuration. Glands of right groin not the least enlarged; no enlargements over body; no eruption. Temperature, $101^{\circ}.2$; pulse 60, and weak. 25th.—Patient complains of feeling hot, and swelling in groin painful. Still able to sit up without trouble, and does not appear very weak, though still wears heavy expression. Tongue covered with dry white fur. Temperature, $101^{\circ}.7$; pulse weak, difficult to count. Swelling in groin unchanged, painful on being handled; no other enlargements found. 26th.—Patient expresses himself as feeling better. Tongue cleaner. Temperature, $98^{\circ}.9$; pulse a little stronger. Swelling in groin seems smaller, giving idea that it is going to recede; not quite so painful. Patient's condition from this continued variable, the bubo almost receding; and I had hopes this case would pull through, but he eventually died, being three weeks sick.

Case VI.—A woman, æt. 30; seen on 26th April. Found her in bed, in a very restless condition, and with difficulty examined; at times she was delirious. She complained of great pain in the head, and had been vomiting a good deal; no diarrhoea. Tongue dry, covered with brown fur. Temperature in left axilla, $102^{\circ}.8$; pulse weak. Examining, I found in the right axilla a rather large, diffuse, red swelling, extending from the axilla on to the pectoralis muscle, very painful on being touched, but I could not make out fluctuation, though it was evident it would suppurate. No other enlargements found; no eruption. Patient had been ill some days, and died same evening, eight hours after my visit.

Case VII.—Also a young woman; seen on 16th April. Had been three days sick. I found patient very ill; skin generally sallow; puffiness under eyelids, and suffering from great prostration. Previous day had severe epistaxis; has been frequently vomiting, and had brought up several small round worms, which I unfortunately did not see; no diarrhoea. Patient complains of pains all over body, and constant pain in left groin. Tongue dry, covered with brown fur. Temperature in axilla, $104^{\circ}.2$; pulse small and weak. Every part of body carefully examined, and all I found was slightly enlarged glands in the left groin; no eruption. Patient died following morning.

Case VIII. (seen on 5th May).—Patient was a young man, æt. about 20; had been sick four days; very prostrate, with all the symptoms of fever. Skin hot and dry; tongue covered with white fur; papillæ projecting. Temperature in axilla, 105° ; pulse 68, small and weak. Patient complains of great oppression over heart. At the nape of the neck I found a large double circumscribed swelling, not unlike what is figured in some of the text-books as

a compound ganglion ; in the centre of each was a gland. The swelling was hard and painful on being touched. No other enlargements found over body ; no eruption. Died same evening.

Case IX. (seen same day).—A young man, æt. 23, had been sick three days, and had just arrived from Macao, his friends believing he brought the disease with him. Patient very drowsy, dull, and heavy when roused ; skin hot and dry ; tongue covered with white fur, tip very red. Has vomited once. Temperature in axilla, 106° ; pulse, 112. In the right groin there was a hard ovoid swelling, about the size of a hen's egg, very painful on being touched ; no suppuration nor discolouration ; other regions, no swellings. Patient was placed in a shed at the rear of the house, where he certainly had the advantage of getting more air, and was removed from the filth of the house. 6th May. —Patient very drowsy ; difficult to rouse, Tongue very dry ; lips and teeth covered with sordes. Temperature, $104^{\circ}.8$; pulse, 100. No change in bubo ; no other enlargements discovered. Patient passed into a comatose condition, and died on 8th, no further symptoms developing.

Case X. (seen on 16th May, second day of sickness).—He was a man, æt. about 40, and I found him lying on the floor in an exposed place,—in fact, almost in the street. By his side was an opium tray, with all the implements, he being a confirmed opium-smoker. Patient was very drowsy, and was with difficulty roused ; skin hot and dry ; tongue dry and red ; sordes on lips and teeth ; complained much of headache ; had vomited several times ; no diarrhoea. Temperature in axilla, $106^{\circ}.2$; pulse 100. In right groin there was a hard ovoid swelling, as large as a hen's egg, painful on being touched ; no fluctuation. Over the dorsal aspect of the right foot there was a small sore, discharging a little pus. No other enlargements discovered. Heart carefully examined ; nothing beyond usual feverish heart discovered. On making the usual inquiry, "Anyone else sick?" I found there was a female child, æt. 10, who had been sick some days, suffering from diarrhoea. She was sallow and very drowsy. Skin hot and dry ; tongue covered with white fur. Could discover no enlargements over body. 19th May —Patient in a dying condition ; all drowsiness gone ; clear in mind, though body very weak ; thanked me for my trouble, and said it would be over soon. Temperature, $102^{\circ}.8$; pulse extremely weak. Lower extremities cold ; tongue, brick red colour ; lips and teeth covered with sordes. Bubo in groin unchanged ; sore on foot discharging a little more. Patient died following morning. Child still looked sick, though purging considerably abated ; skin hot and dry ; tongue covered with white fur. Temperature in axilla, $104^{\circ}.6$. At the angles of both jaws I found slight, hard enlargements ; no eruption or enlargements on trunk. She made a good recovery.

From the above cases it is seen how fatal the disease is. Out of all the cases I saw, only two recovered—the two children I have mentioned. It is necessary to say that I only saw a small proportion of the afflicted. I have tried to gather information concerning the symptoms and conditions of plague elsewhere, that what has been observed in China may be compared with them. I will group first in the order of most constant presence the symptoms in my own cases :—

1. High fever.
2. Glandular swellings or buboes, varying in size from a large betel-nut to a hen's egg ; seldom more than one present ; hard and painful ; do not suppurate ; groin most frequent site.
3. Sallow hue of skin.
4. Heavy odour from breath.
5. Pulse small and weak.

6. Bilious vomiting.
7. Most cases great prostration.
8. Tongue varied ; mostly dry, with fur.
9. Sordes on teeth and lips.
10. Delirium.
11. Restlessness.
12. Respiration somewhat hurried.
13. Bowels loose, fetid odour ; no diarrhoea.
14. Præcordial oppression.
15. Thirst not intense.
16. Drowsiness, passing to coma.
17. The young more frequently attacked.
18. Incubation appears short.
19. No eruptions were observed.
20. Great mortality among rats ; no other animals attacked.

In Yunnan the symptoms observed were :—

1. Fever slight,—increasing.
2. Dark red swellings in groin, armpits, etc., size about hen's or goose's egg.
3. Mr. BABER was informed that eruptions of minute red pustules appear in the armpits and other glandular regions. He does not speak of buboes being present at all.
4. Rat's mortality great ; other animals were attacked.

In India the symptoms were :—

1. Slight fever.
2. Glandular enlargements not essential ; some cases rapidly fatal without them.
3. Suppuration commonly ends in return of health, but not always. Health recovered with recession of buboes.
4. Occasionally pulmonary hæmorrhage.
5. Disease varies in intensity.
6. Prefers women and children.
7. Extremely fatal ; not amenable to treatment.
8. Muddy look ; lustrous eye ; white tongue ; difficult articulation ; præcordial oppression.

It naturally occurs to one, after seeing all these cases, to inquire what really is the disease, and what is its cause. I fear I myself have little light to throw on the subject, and no definite theories to put forward.

Beginning with the causation of the disease, I hold—1st, that macerating filth must have much to do with it ; and the remarks I have already made as to the condition of the town and houses warrant my statement. 2nd, want of sufficient ventilation, considering the number of human beings that are crowded to sleep in one house ; and from fear of thieves the houses are carefully shut up, even on the hottest nights. As for the specific cause, I am not at present prepared to say what the contagium is ; but whatever it be, I am inclined to think it is one that requires a certain high temperature to bring it into activity. I have already spoken of the dry winter, and how the floors of the houses must have got sodden with excrementitious matter ; but it was not till the temperature began to rise that the disease manifested itself, continuing its march till we had a higher temperature and rain began to fall. The degree of contagiousness of the disease seems variable, for in the houses where I was it did not appear to attack all the members in the sweeping manner we should expect. At the same time it must not be forgotten that many, from fear of contracting the disease, removed, that is, they did not sleep in the houses with

the sick. Frequently some one had died before I came to the house, and others may have been taken sick after my attendance ceased. In Case II. the boy arrived from a distance, took sick, and died in 48 hours; no one else had been ill in the house, and no one took sick afterwards. There were not many persons in this house, and none were young. The inference I draw is that the boy contracted the disease elsewhere, as he became sick about eight hours after his arrival in Pakhoi. From what I have seen I believe the incubation of the disease to be short, but I regret not having any conclusive proof. Had anyone else taken ill in the house of Case II., I should have had some clue. The disease may, I think, be defined as a specific contagious fever, of short duration, accompanied by glandular swellings, and very fatal. There certainly appear slight differences between what I have observed and the descriptions given of plague elsewhere, but in the main they agree. It is evident that the cases differ; in my own there were differences, though not very material. Cases IV. and VI. seemed to be of a delirious form; Case IX., comatose; Cases III. and IV., nervous or excitable. Again, there were cases with little or no glandular affection, like Case VII. Certainly none of my cases resemble what Mr. BABER speaks about, nor does this latter bear much resemblance to what Mr. ROCHER observed. The question arises whether plague takes different forms in different parts of Yunnan? Possibly it may; but if it were not for the fatal nature of the disease of which Mr. BABER tells us, I should almost say it was "dengue," as there certainly seem points of resemblance to that disease. Some cases of small-pox were said to be present during the epidemic here, but none came under my notice, and I cannot believe there were many. Of the diseases we are familiar with, the one under review most resembles typhus fever. Anyone going to the bedside of a patient would certainly at first think it was that disease he had to deal with.

In concluding my remarks, I have only to add that my treatment was various. In most of the cases there was little time for anything to act. I gave nitro-hydrochloric acid; quinine; large doses of aromatic spirits of ammonia; chlorate of potash, etc. To the buboes I tried poultices and lotions, but never felt justified in using the knife. For the excessive temperature, tepid sponging was ordered, and I did my utmost to urge upon the people the absolute necessity of giving plenty of nourishment; how far that was carried out is very doubtful as it would be alien to all Chinese therapeutics. The Chinese treatment appears to have been chiefly the administration of one of their "cold medicines." I understand *shêng-ti* (生地), *mai-tung* (麥冬), *huang-lien* (黃蓮), and *shüan-shén* (玄參) were given largely. A brown paste was put on the buboes, but the physicians acknowledged their treatment to be futile. Had all these unfortunate sick been at once removed to healthy ground, with free ventilation, and with systematic administration of both nourishment and medicine, it is possible I might not have to record so many deaths. I saw them in their wretched homes, unsurrounded with the care and nursing to which we are accustomed. It is possible they attempted to carry out my directions, which to them must have appeared singular, none having come much into contact with foreigners, much less foreign therapeutics. Recently I have learned that turpentine and camphor were given with some success in the two Malta plagues; neither drug was tried by me here. I much regret not having secured a *post mortem*, but it could hardly be expected, dealing with people who have such strange superstitions about their dead. I have to regret also not having satisfactorily examined the blood under the microscope. The dead were quickly buried, and not left exposed, as seems to be the practice in Yunnan.

APPENDIX D.

NOTES ON THE FIRST PLAGUE EPIDEMIC AT CHANGPOO, FOKIEN, SOUTH CHINA.*

By J. PRESTON MAXWELL, M.B., B.S., F.R.C.S.

As will be readily seen on reference to the sketch-map provided, Changpoo is the principal city in a large area of country to the south-west of Amoy. Its inhabitants number about 20,000 and the foreign community is entirely missionary. Thus we have here to deal with the spread of disease amongst a pure native community, free from European innovations in the way of steamer or railroad communication.

As to the map provided, the coast-line is taken from the Admiralty charts, and the inland places are assigned their position partly by reference to a local missionary map and partly from the knowledge acquired by the writer in travelling over the region.

With these preliminary notes, let us pass to the consideration of the subject in hand. Let me remind my readers of the past history of the disease.

Western China is held to have been an infected place for hundreds of years. But the beginning of the plague of modern times took place in the region of South Kwangtung. Thence it was carried to Canton and Hongkong in the year 1894. Shortly afterwards Amoy became infected.

It is very interesting to trace its subsequent course. Let me direct your attention to the map. There are two main routes whereby Changpoo may be approached. The *first* is *via* Pechuia, Koa-jim, and Tngkio. From Amoy to Pechuia the journey is undertaken in large junks, many of them infested with rats, and of which a large number are engaged in mixed trade. The journey takes but a few hours, and, as might have been expected, shortly after the plague broke out in Amoy, rats and subsequently men succumbed at Pechuia, and plague has been endemic there since that time. From Pechuia to Koa-jim one travels by small flat-bottomed boats, and the trip takes several hours. The plague appeared in Koa-jim for the first time in 1900, and was preceded by the usual rat mortality. It was not very severe and ceased about the end of July, to re-appear in a severer form in the month of May, 1901.

Between Koa-jim and Tngkio, the journey must be performed on foot, or in sedan chair, and several high plateaus have to be crossed. There is a river, but it is exceedingly shallow, and almost unnavigable. From Tngkio, where the plague has not yet appeared, to Changpoo, one meets with the same description of road, but there is a high and difficult mountain pass to be crossed.

The *second* route is by sea from Amoy to Kotin. Large junks, some of them rat infested, go round laden with kerosine oil, food stuffs, &c. From Kotin they can ascend the river to within four miles of the city, and flat-bottomed boats can go right up to the city gate when the water is high.

There is one other trade route which must be taken into account. In the region around Pehsoa are a scattered set of villages whose inhabitants are fishermen, and who send large junks down to Hongkong with fish.

* Extract from the Journal of Tropical Medicine—15th January, 1902.

As I have before stated, in 1894 plague appeared in Pechuia. This place is almost on the sea-level and to strike further inland a high mountain pass must be crossed. The significance of this will be seen later on.

The second place in which plague appeared, was the set of fishing villages around Pehsoa. In 1896 several men were brought home suffering from plague (from Hongkong) and died shortly after arrival. Immediately on the back of this, a rat plague commenced, and rats died off in numbers. From this time the plague spread into all the villages in the neighbourhood and also in O-chio, the human mortality being *preceded* by a severe rat mortality in every village attacked. Then, as the end of June approached, the disease died down. Next year (1897) Kotin became affected. I cannot gather any evidence to determine whether this epidemic was due to a spread from O-chio (about six miles away) or to infection carried by junk from Amoy. In any case it has appeared in both places every year since that time.

In 1897 the disease does not appear to have spread further.

In 1898 O-chio was more severely visited. A Changpoo man, who had been there gambling, was brought home to the city, suffering from plague and died, but the disease did not spread.

In 1899, about the end of May, plague started in a house in the centre of the South Street, Changpoo, and about fifteen persons died. There was also a large rat mortality in this area and the plague was spreading, when there came two or three days of tropical rain. The city streets were flooded several inches deep and the plague ceased to spread. How the disease was introduced on this occasion I have no idea, and can obtain no information on the point.

In 1900 there were no cases of plague in the city as far as I can find out, but towards the close of the year it broke out badly at Liok-khe-kio, a small village on the river about two and a half miles from Changpoo, and there was a considerable mortality.

In 1901 the first real epidemic occurred in Changpoo city.

I have made careful enquiry in all directions, and have carefully sifted all information before accepting it as true.

The plague began in the house of a fish-seller (who later on came under our hands for treatment), near the West Gate, which admits travellers from the Kotin and Liok-khe-kio regions. *First*, a rat or two died in the house, then the fish-seller's wife was seized with bubonic plague (right groin) and died after a few days' illness. This fish-seller used to go down twice a week to Kotin, where plague was endemic, and bring in baskets of fish for sale in the city, both salted and fresh; this fish on arrival was sorted and in some instances washed in the house. The time was the first week in April. Within the course of the same week the rats began to die in houses immediately adjoining, and shortly after there were many people attacked in the immediate neighbourhood. At the same time rats began to die in other houses and shops in the city, and as far as I could learn the rat death *preceded* the inmates' attack about a week; but the time was not absolute.

In *all* the earlier cases which I attended there was no difficulty in obtaining a history of the previous death of one or more rats in the house. As the epidemic progressed, this was not so easily done, and the people became very reticent on the subject. The plague spread with great rapidity, and it is computed that 1,500 out of the 20,000 died before the 25th of June, and 2,000 or

thereabouts fled the city. On the 15th, 16th, and 17th of June rain fell in torrents and almost continuously, and the whole of the city was well washed out, parts of it being flooded. The plague immediately declined and was practically finished in a week.

Consider for a moment or two the method of infection and spread of plague. As to the cause of plague there is no doubt, for the micro-organism can be easily isolated and identified. But how is it introduced into the body and carried from person to person?

Putting aside for the moment the pneumonic cases, which I am inclined to believe form a class by themselves, one is left with the bubonic and septicæmic cases, which form the vast bulk of the attacks. And one is at once struck, and this in company with other observers in different parts of the globe, with the remarkable conjunction of the rat mortality *followed* by human mortality. So much is this the case that the Chinese term for the plague is "the rat plague," and they know as well as the doctors the connection between the two.

INFECTION BY THE BITE OF A RAT.

But how does the poison get transferred from the rat to man? Sometimes by the direct bite of the infected rat. This is rare, but the following case will serve as an example:—

A man was wakened one night by a rat biting his head. It drew blood. When he had struck a light he found the rat dying close to his pillow. It was at once removed. In twenty-four hours he was seized with plague, and in another twenty-four hours was dead, there being no sign of a bubo before death took place.

RAT-FLEAS.

It has been suggested that the rat-flea acts as a carrier for the micro-organism. Certainly there is every probability of this proving to be true. One afternoon I was called to see a rat which was dying of plague in the court of one of the Chinese houses in which some of our servants lived. When I reached the spot the rat, a fine, medium-sized one, had just died, and the stones all round were dotted with fleas, which were rapidly deserting its body. I did not approach nearer than two and a half feet, and then only to sluice the rat and surrounding region with kerosine, but in that short time I acquired two specimens, which jumped on to the bottom of my white trousers. Altogether I counted off that one rat *thirty-five* fleas.

Granted that this flea can bite man, a matter which has been denied, one can easily realise how one rat may spread disease, and how eleven members of a family may all die in a single week from the disease; and this theory fits in with and explains cases like the following:—

(1.) There are two adjoining villages about two-and-a-half miles from the city. To both villages cases of plague were carried from Changpoo. In the one six cases were thus introduced; all died, yet the plague did not spread. Why? One fact is striking, the rats (of which there were plenty in the village) escaped infection, and there was no rat mortality.

Contrast the fate of the companion village. Here cases were likewise introduced and died but shortly after their introduction. Rats began to die in the

neighbourhood of these cases, then scattered throughout village, and cases of the disease quickly occurred.

(2.) In another village, about a mile outside the city, rats began to die in the house of a stone-cutter who had not been out of the village for two months. In a week more he was attacked with the disease and died. His house was the nearest in the village to the main highway.

(3.) A woman, on rising in the morning, found a rat which had died during the night close to the head of her bed. In a day or two she was taken ill with plague and a cervical bubo developed in the more superficial upper cervical glands and on the side next the place where the dead rat had lain. It was impossible to identify any special insect-bite in this area, but the occurrence is suggestive

But how does the rat become infected in the first place? My own opinion is *by means of infected food*. As is well known, rats are voracious and by no means dainty feeders—all is grist to their mill.

Take the case of the fish-seller, who may have brought home an infected load of fish from Kotin. It is washed and sorted at home, but during the night the rats got at it and start the ball rolling, the disease spreading like wildfire from rat to rat without the necessity for a fresh infection.

FOOD INFECTION.

As to how the food gets infected it is doubtful, but there are many open avenues.

(1.) I have seen men with and without suppurating buboes, handling fish, vegetables and cakes, and even selling the same on the streets.

(2.) A pneumonic case is another source of danger. I have seen such a one expectorating all over the room with its earthen floor and the fowls and dog eating up the sputum.

(3.) A third source of infected food is the bodies of those who have died of plague. Many instances of corpse-eating by rats could be put on record, and I know of several cases where plague bodies have been gnawed by them. During the present year (1901) a plague body was buried hastily in a mat in some ground near a missionary institution, which stood some distance away from other Chinese houses. It was found that the grave had been entered by rats, and they were seen leaving its vicinity. In a day or two rats began to die in the portion of the institution nearest to the grave, and a small outbreak of plague occurred.

DID RATS INFECT CHANGPOO?

But it may reasonably be suggested that the Changpoo epidemic was due to an immigration of infected rats from the outskirts of Liok-khe-kio to the city. There is no doubt that rats do migrate from unhealthy to healthy places. Our own mission houses may serve as proof. Standing in a fine compound, shortly after the plague began, we were troubled with these nightly visitors, who in numbers got into our ceilings and raced around the verandahs at night. On one night there was a large number of these on the verandah who made a deliberate attempt to get in through one of my glass window-doors which was closed. With the cessation of the epidemic these entirely disappeared, presumably having gone back to old haunts.

But the evidence against the theory of the infection of the city is weighty.

Firstly, there is a large suburb outside the West Gate, which should have been first attacked, but was not affected till long after the city.

Secondly, if there had been an invasion of infected rats, one would have expected a much more general outbreak, whereas during the first ten days the disease was localised to a few houses. In some villages, as at O-chio, the disease was certainly carried from village to village by rats, and it will be noticed by reference to the map that, whatever be the reason, the course of the disease has been on the level, and that where roads had to pass over mountain passes, as to Tngkio, O'sai, or inland from Pechuia, the disease has not spread in these directions, although there are regular trade routes over these passes.

But passing from the share taken by the rat in spreading the disease, are there not other channels of infection? A second channel of infection is directly by means of infected food. In a village which is as yet uninfected, a woman, whose sole connection with the city is that some of the food she eats was brought from there, develops an attack of plague with a tonsillar gland bubo. There was no doubt about the diagnosis, and although very ill she pulled through. Instructions were obeyed and the village has not had another case of plague. There has been no rat mortality there.

As I have previously stated, the people are extremely careless in this respect, those recovering from plague, handling and hawking food; and the flies in Eastern lands are so numerous and persistent in their attentions that they may easily carry infection and so poison the food. As to whether this is a common mode of infection it is difficult to form conclusions. On the whole I think the evidence is against that view.

INFECTION BY AIR-PASSAGES.

A third channel of infection is by means of the respiratory passages. I presume most of the cases of plague pneumonia arise in that way. This would explain the occurrence of more cases than one in the same house with much the same clinical features. The sputum in these cases swarms with the bacilli, and in some is a pure culture of the same; and it is easy for those who attend on such a patient, who is distressed, and towards the end sometimes fighting for breath, to contract the disease by inhalation as he splutters and spits about the room. Fortunately these cases are not very common.

INFECTION BY THE SKIN.

A fourth method of entry is through a small wound in the skin. I am inclined to think that the existence of this as a separate channel of infection depends on the introduction at the same time of other micro-organisms. If the plague bacillus is introduced alone and in small quantity the skin lesion is probably trifling, but when another poison is superadded you get the following class of cases. A small bulla develops at the site of inoculation. Simultaneously a bubo appears in the glands supplied by this area, or at the least within an hour or two, and the fever also *begins* at the same time. I have seen four cases of this nature. It must be clearly understood, that in these cases the local reaction precedes or is co-existent with the commencement of the fever. In due course the bulla may dry up and form an eschar or may spread and the skin in this region become gangrenous. These gangrenous patches are distinct from those which come on during the course of the disease and are more of the nature of a pyæmia, as in a case to be narrated subsequently.

But after all is said, one must confess that as yet the exact method of infection in the majority of cases is, to say the least, obscure.

AGE, SEX, AND OCCUPATION.

Age, sex, and occupation, have but little influence on the incidence of the disease. Babies of a month or so old I have known to get it, and old men of 70 to 80 years of age likewise contract it. But the young and strong form the bulk of the cases. A moderate temperature seems to be the most favourable for its development. The Changpoo outbreak began at the commencement of the hot weather, which this year has been unusually moderate, not over 90° in the shade while the epidemic was rife.

THE EFFECT OF FLOODS.

One etiological factor seems to me of distinct importance. It will be noticed that the small outbreak of 1899 and the severe one of 1901 both ceased after the flooding of the city with rain-water. What is the connection? It may be a mere coincidence, but it looks as if the thorough cleansing of the streets, and in many cases the houses also, had contributed to its removal. The underground locations of the rats were probably flooded, many drowned, and the rest driven out. Against this view is the fact that these rats seem to like the rafters and eaves quite as much as their earth or drain homes.

As has been previously noted by other writers, the earlier cases of the epidemic were for the most part most severe, and septicæmic and pneumonic cases were by no means uncommon at the commencement.

APPENDIX F.

1.—PAKHOI, SOUTH CHINA, SITUATED ON A PENINSULA (Latitude 21° 29' N.; longitude 109° 6' E.).
PAKHOI IS A TREATY PORT OPENED 1877.

Population: 20,000 Chinese, 60 Europeans.

1. Name of Province and Name of Doctor replying. Kwangtung. Dr. J. H. Lowry.
2. The month and year in which the first outbreak of plague occurred or made its first appearance. Chinese say 1867. Severe outbreak 1877. Observed by myself March, 1882 (I was the first European medical man to arrive in the port).
3. Was the plague recognised as a new disease? No, not by the Natives.
4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? No.
5. Did the first cases attack any special classes of men or houses? Coolie class. Shops and stores. Natives always living in same.
6. Where was the plague imported from? Possibly Province of Yunnan. M. ROCHER in his "Province Chinoise du Yunnan" speaks of plague being in Yunnan 1871-3. Mr. BABER in his "Notes on Route of Mr. Grosvenor's Mission through Western Yunnan" (Blue Book) speaks of plague.
7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? Probably by both road and water from Lien-chow. Coolie carriers.
8. In what year since the first outbreak and in what month has the plague re-appeared? Since 1882. Re-appeared Lien-chow 1883, 1884, Pakhoi 1885, (Lien-chow) 1894, 1895, (Hotuk) 1897-1899 (800 deaths), 1900, Lien-chow 1902, April, May.
9. Was the plague outbreak preceded by a rat mortality? No, not so far as I could find out. I heard of the rat mortality simultaneously with my seeing plague cases.
10. During what months does the plague prevail? March to July.
11. What influence, if any, has rain on its prevalence?
(a.) Slight rain. (a.) Slight rain with heat fosters the disease.
(b.) Heavy shower. (b.) Heavy rains markedly influence the epidemic, the town is cleansed, and the disease becomes less.
12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? I have not met any.
13. Do you know of other animals besides rats suffering from plague, if so, what are they? No, rats only.
14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? I have not heard or observed any illness amongst pigs or cattle preceding plague outbreak.
15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? I believe the disease to be infectious. The friends handling and attending to the sick nearly certain to contract the disease, those coming in contact with the breath of the sick.
16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each.
Village of Hotuk 2 miles distant. } Same months and
" " Tikok do. } years as Pakhoi.
City of Lien-chow 12 miles distant, }
Town of Anpu (100 miles east of Pakhoi) March, April, 1892. Said to be epidemic now.
17. Further Remarks:— I have long been convinced that the disease is the result of filth and dirt, bad sanitation, and overcrowding goes with it. The houses are one-storied and the floors are mud, and become excrement sodden. The doors are the only means of ventilation; at night they are all closed securely for fear of thieves. The streets run parallel one above the other down to the water's edge, so the filth and dirt percolates downwards. Up on the sandy plain above the town I have never found plague cases. The town has an incline of 1 in 20 falling towards the sea with a slight trend from east to west. So long as China takes no steps in the way of sanitary reform, plague must recur. The years that there has been a let off are those where there has been a plentiful downpour of rain—Nature's own Scavenger. A certain high temperature is necessary to bring the disease into activity and with a certain higher temperature 90° to 90° F) the disease distinctly becomes less, and the epidemic for the year is over in the month of July. I never had a chance of examining blood, the people were in early days too superstitious. 1902—Rain is wanted very badly, nearly all the wells are dry, practically no rain since August last year.

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|---|---|
| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. Abbatuine. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Probablement année 1877. Le premier rapport Médical qui la signale est celui du Dr. Lowry (1882). |
| 3. Was the plague recognised as a new disease? | Il n'y a lieu de signaler aucun cas spécial annonçant son explosion. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | Pauvres et riches, vivant en promiscuité, sont aussi bien frappés les uns que les autres. Cependant les quartiers les plus sales de la ville semblent être visités les premiers. |
| 5. Did the first cases attack any special classes of men or houses? | Du Yunnan, qui entretenait autrefois des relations commerciales suivies avec Pak-hoi; sans doute par Longtcheou, Nanning, Kin-tcheou, Lien-tcheou. |
| 6. Where was the plague imported from? | ..... |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | ..... |
| 8. In what year since the first outbreak and in what months has the plague re-appeared? | ..... |
| 9. Was the plague outbreak preceded by a rat mortality? | La mortalité par les rats coïncide, en général, avec l'apparition de l'épidémie. |
| 10. During what months does the plague prevail? | Mars, Avril, Mai, Juin sont les mois qu'elle affectionne spécialement. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | La sécheresse semble exercer une influence non douteuse sur son apparition et les fortes pluies sur sa disparition. Cet d'ailleurs aussi l'opinion Chinoise. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | La forme " ambulante " de la peste semble ici extrêmement rare. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Les cochons serait, paraît-il, quelquefois atteints de peste. Je n'ai pas vérifié le fait. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Non. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Le déclin de l'hygiène et la saleté bien connue des Chinois semblent être les principaux facteurs de propagation. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Ti-kok, Kao-tak, Nam-hung, Lien-tcheou, Kin-tcheou, etc. Voir, à ce sujet, les renseignements topographiques qui vous sont fournis par le Docteur Lowry. |
| 17. Further Remarks :— | Ne se trouvant ici que depuis septembre dernier, il me serait difficile de vous fournir sur les épidémies antérieures rendes seignements plus détaillés que ceux trouvent dans les " Customs Medical Reports." Je m'occupe néanmoins d'étudier d'assez près l'épidémie actuelle, mais, son évolution n'étant pas encore terminée, il serait prémature de porter dès à présent un jugement sur son compte. |

3.—PAKHOI—Continued.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. E. G. Horder. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | March, 1882. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | ..... |
| 5. Did the first cases attack any special classes of men or houses? | The poorer class residing in the worst houses and dirtiest streets were specially attacked. |
| 6. Where was the plague imported from? | Yunnan. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Road traffic. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | My observations since 1886 lead me to conclude that plague is endemic in Pakhoi and surrounding country, that during 1894 and 1898 was epidemic in April and May. |
| 9. Was the plague outbreak preceded by a rat mortality? | Cannot say for certain; know of instances where rats have fled from premises afterwards attacked by plague, in which deaths have occurred. |
| 10. During what months does the plague prevail? | Usually March, April and May. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Rain usually means a cessation of the epidemic in Pakhoi. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Not from personal observation, but have heard of pigs and chickens being attacked. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not heard or seen any. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Wearing clothes of deceased persons who had suffered from plague; also dirt, overcrowding, insufficient food, insanitary dwellings. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Ko Tak (town), and Liamechau Fu, Ma Lan (village), and Ti Kok (village). |
| 17. Further Remarks:— | During the epidemic of 1894, both here and in Hongkong, where I assisted Dr. Lowson, it was most noticeable that the insanitary parts of these places suffered most severely. The disease, however, in later years both in China and India and elsewhere has not apparently confined itself exclusively to the poor, but extended its ravages in the midst of the better classes of society. I fail to see, therefore, that fresh air is to be the panacea for all cases of plague as prescribed by some, although it is a necessary adjunct. Rats, doubtless, should be exterminated—an utterly impossible procedure in a Chinese Town or City—but there is something more to discover after the last rat is killed and every house is cleansed, before plague is swept from our midst—and I earnestly trust it may be your good fortune to make that discovery. |

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. L. G. Hill. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | March, 1882, when it was first observed by a medical man—(Dr. Lowry). |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | ..... |
| 5. Did the first cases attack any special classes of men or houses? | The poorer classes and the more insanitary dwellings—Europeans exempt. |
| 6. Where was the plague imported from? | The province of Yun-nan <i>via</i> the Trade Route. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By road traffic and by coolies. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Since my arrival here (1895) there has been one severe outbreak—1898, April to June. Other years endemic, always in the spring, especially 1896, 1897 and 1899. |
| 9. Was the plague outbreak preceded by a rat mortality? | Rats died, both before and during the outbreak, in increased numbers. |
| 10. During what months does the plague prevail? | April, May and June, and sometimes March and July. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Has not been observed to affect it either way.
(b.) Heavy rains often mean its rapid cessation. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | I have not known of any. But pigs, dogs, and even oxen are said by the natives to suffer. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | ..... |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Overcrowding, want of cleanliness, wearing of deceased persons' clothing, and the like. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Lim-chau-fu (city), June, 1898, Ko-tak (town), Ti-tok (village), Ma Lan (village). |
| 17. Further Remarks:— | <p>I believe the disease is largely conveyed by the breath producing the <i>pneumonic</i> form. We have found the plague bacillus on the mucous membrane of the mouth and nose and taken cultivations from the first named. I believe it is also conveyed by fleas, bugs, flies and other blood-sucking insects, a bite from these previously infected insects setting up lymphangitis and the <i>bubonic</i> form of plague.</p> <p>It is not possible to give the dates of the first outbreaks under Question 16 as plague has been endemic for so many years before one came. The map is also omitted for the same reason. My Chinese Teacher succumbed to the plague in 1898. He lived in the town and came to me on the Plain every day. He died within 48 hours, but no one either in my bungalow or in his own house took the disease. No one in our Mission Hospital ever contracted the plague from out-patients suffering with it.</p> <p>Also, consult the Chinese Customs Medical Report under "Pakhoi."</p> |

5.—CANTON (Latitude 23° N. ; longitude 113° E.).

Population: About 2,000,000.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Rev. T. McCloy. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | February, 1894. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | All classes and kinds of houses. |
| 6. Where was the plague imported from? | Difficult to say, but it has been known for years in Yunnan Province, and probably came from there. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | How it came is a mystery, but in its epidemic form started in Canton and worked out from here. There are two ways by which the infection might come: the one by Kwai Lin, the other by Lan Chau Fu, Kwang Si Province. There are a great many boatloads of cow bones come down both these ways and are made into tooth brushes in Canton, also great quantities of cow hides, and probably the latter is the true explanation, as Tanner Street (Ho Pün Kai) in Canton was the worst of all and was literally depopulated in the epidemic of 1894. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Every year a little; but generally severe 3 or 4 years. February. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | From February to July. |
| 11. What influence, if any, has rain on its prevalence? | |
| (a.) Slight rain. | (a.) Probably no influence. Lessens it somewhat probably. |
| (b.) Heavy shower. | (b.) Heavy showers and followed by very hot weather almost stops the disease, so any remedy must be along these lines. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | There are mild cases with buboes present, but the patient generally has fever and is so miserable that he cannot walk about. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Yes, but does not seem to have any connection with plague. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | (1) Rats; (2) persons suffering from the disease and going home to town or village. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | The whole of the Delta and West River towns and market places. 1895, about February. |
| 17. Further Remarks:— | The remedy seems to be in cleansing and excessive heat. I should like to see some method tried in Hongkong under foreign supervision whereby thorough cleansing and great heat (natural or by medicine) could be applied to all the drains early in the Spring of each year and at intervals. |

6.—CANTON—Continued.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. (No Signature.) |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | February, 1894. |
| 3. Was the plague recognised as a new disease? | Yes, <i>by the Chinese</i> . |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | Yes, the poor classes. |
| 6. Where was the plague imported from? | In all probability from the extreme western portion of this Province. The disease was active in Mui Luk, 300 miles S.W. of Canton, thirteen months before it appeared here. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By water. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Generally appears in February or March—most active in the years 1894, 1896, 1898 and 1901, diminishing in numbers and severity. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | Largest number of cases are apt to happen from April to June. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) No appreciable effect.
(b.) If continuous or abundant have a beneficial effect. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Have seen very few of this type and consider them rare. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Cats, in a few instances. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not that I have known of. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Filth, lack of sunlight and fresh air. I believe rats are unquestionably the principal medium by which infection is carried. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | My work keeps me closely confined to Canton City; have had no personal experience elsewhere. |
| 17. Further Remarks:— | |

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Rev. R. H. Graves. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | 1894. |
| 3. Was the plague recognised as a new disease? | Not entirely. It was said by the Chinese to be common in Yunnan Province. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | None. |
| 5. Did the first cases attack any special classes of men or houses? | No. The ill-nourished persons and those in dark, damp rooms may have had it in larger proportion. |
| 6. Where was the plague imported from? | I do not know. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Not that I have heard. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | It began usually in the Spring months. |
| 9. Was the plague outbreak preceded by a rat mortality? | The rats seem to convey the poison to human beings. The rats have died off with it. |
| 10. During what months does the plague prevail? | No one month. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | I think frequent heavy showers tend to flush the drains, and so are beneficial. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Cats, chickens. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | I do not know, but have heard that rinderpest frequently precedes it. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | It is mainly due to rats. <i>I have known it to be caused by eating diseased chickens.</i> |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | ..... |
| 17. Further Remarks :— | The Chinese think it proceeds originally from the earth. When it attacks chickens the skin is covered with dark spots (ecchymoses?). I know of three women dying of the plague after partaking of a chicken thus diseased. The rats seem to become dazed or crazed and run as far as they can from the drains, going preferably to the second or third stories. They drop down dead. If not discovered immediately they convey the infection. I had several cases on my premises. |

8.—CANTON—Continued. (Shameen Concession.)

Population : Said to be 800,000 (uncertain).

1. Name of Province and Name of Doctor replying.	Kwangtung. Dr. B. N. Ringer.
2. The month and year in which the first outbreak of plague occurred or made its first appearance.	Not then in Canton, but dealt with by Dr. ALEX RENNIE fully in his report in Customs Medical Gazette, 1894, or 1895, who was then residing here.
3. Was the plague recognised as a new disease ?	
4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances ?	
5. Did the first cases attack any special classes of men or houses ?	
6. Where was the plague imported from ?	
7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc. ?	
8. In what year since the first outbreak and in what month has the plague re-appeared ?	
9. Was the plague outbreak preceded by a rat mortality ?	
10. During what months does the plague prevail ?	More or less from February to August or later, though on the wane then.
11. What influence, if any, has rain on its prevalence ? (a.) Slight rain. (b.) Heavy shower.	(a.) Probably injurious. (b.) If prolonged and continuous, probably beneficial.
12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness ?	Have not met with any.
13. Do you know of other animals besides rats suffering from plague, if so, what are they ?	No.
14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak ?	Rinderpest.
15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease ?	Want of sanitation and all precautions on the part of the Chinese.
16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each.
17. Further Remarks :—

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|---|---|
| 1. Name of Province and Name of Doctor replying. | (No Signature). |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | February, 1894. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | Especially those old houses near the City wall. |
| 6. Where was the plague imported from? | Southern part of Yun-nan Province |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | I think both road and water. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Every year. |
| 9. Was the plague outbreak preceded by a rat mortality? | ..... |
| 10. During what months does the plague prevail? | Between April and May. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Has some influence to produce this disease. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Don't know. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | ..... |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Germs carried by rats. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | ..... |
| 17. Further Remarks:— | I believe the climate has a great deal to do with this disease. Moist and warm climate favours the growth of the germs. |

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Miss Regina Bigler. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Early in the year 1894. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | No. |
| 6. Where was the plague imported from? | Seems to have originated in the poor quarters of the City. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Apparently not. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Each year until this, during the Spring months. |
| 9. Was the plague outbreak preceded by a rat mortality? | Think it was rather concomitant with it. |
| 10. During what months does the plague prevail? | From February to June or July. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | I have not thought that rain alone had any effect, decreasing only when the extreme heat comes on. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Toward the end of the epidemic have observed such. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not to my knowledge. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Infection, developed by insanitary conditions. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Cannot give definite answer. Certain villages may be entirely free from it one year and severely affected the next. |
| 17. Further Remarks:— | |

11.—CANTON—Continued.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. Adolfo Razlag. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | End of January, 1894. |
| 3. Was the plague recognised as a new disease? | Not known amongst the people before. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | Chinese. |
| 6. Where was the plague imported from? | Seems, by the way, as the people believe, from the Province Yunnan. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Water traffic—air. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Every year since. But 1896 and 1898 very few cases. This year, month of May, I heard of 4 cases but did not see them personally. |
| 9. Was the plague outbreak preceded by a rat mortality? | My information shows that to some extent more dead rats were found just at the outbreak of the plague and in the time of the plague, than before, and a good many cats are said to have disappeared from the houses; where to? |
| 10. During what months does the plague prevail? | Late in the Spring and beginning of the Summer. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Heavy showers beneficial, but very little. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes, some one for 3-4 days or more. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Few cats as far as known. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | No, but small-pox and scarlatina were noted. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Infection—own opinion by the air—transmission to clothing by cats. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Canton, January, 1894. |
| 17. Further Remarks:— | |

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. J. B. J. Swan. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | February, 1894. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | No, unless the poorer classes, as a rule. |
| 6. Where was the plague imported from? | From Mui Luk in the South-west end of Province. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By water traffic—no special class. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | March and April, 1896, 1898, 1900. A little in 1901. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | Usually March to June, the worst. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Slight rain—none. Heavy shower—beneficial, lessens the number of cases. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Have never seen anything; there are very few, if any. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Yes, cats. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | None. |
| 15. What opinion have you formed from your own observations as to the main cause or causes of the spread of the disease? | Rats, undoubtedly. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | My work confines me closely to Canton City. Many villages and large towns within a radius of 100 miles of Canton, mostly to the South-west, have been affected to a marked extent. |
| 17. Further Remarks:— | ..... |

13.—CANTON. I first gained experience of Plague in Canton during the epidemic of 1894 and subsequently in Hongkong from 1896 to 1902.

Estimates of the population of the City and suburbs of Canton, as of all Chinese cities, are very diverse. No reliable census is ever taken and one can only guess approximately. I place the population about 1,500,000, but I observe that the most recent estimate as given in the annual Trade Report of the Chinese Imperial Maritime Customs places the number as high as 2,500,000; this is, I believe, considerably over the mark.

Hongkong. The population as ascertained by the census taken in January, 1901, was 283,975, consisting of Europeans and Americans, 3,860; Portuguese, 1,956; Indians, 1,453; Eurasians, 267; other races, 903; Chinese, 274,543.

1. Name of Province and Name of Doctor replying.
2. The month and year in which the first outbreak of plague occurred or made its first appearance.
3. Was the plague recognised as a new disease?
4. Had you met with any cases previous to the outbreak, if so, when, and under what circumstances?
5. Did the first cases attack any special classes of men or houses?
6. Where was the plague imported from?
7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.?
8. In what year since the first outbreak, and in what month has the plague re-appeared?
9. Was the plague outbreak preceded by a rat mortality?

Canton is the chief City of the densely populated Kwangtung Province, and is one of the richest cities in the Empire. It lies about 90 miles to the West of Hongkong on the Chee Kiang, or Pearl River in latitude 23 deg. 7 mins. 10 sec. North, and longitude 113 deg. 14 mins. 30 sec. E. Being situated inland and somewhat further north than Hongkong, it has a colder climate in winter and is warmer in summer.
Dr. A. Rennie.

In Canton plague first appeared during February, 1894. In Hongkong cases were not observed until about two months later, although many Chinese in Canton were positive as to its prevalence in Hongkong earlier in the season, assuring me that they had relatives in Hongkong dying of a disease similar to that prevalent in Canton.

Yes, at first the native doctors in Canton were quite ignorant of the nature of the disease and spoke of it by such an indefinite term as "Shik-i," season epidemic—applicable to any disease prevailing in epidemic form. Later on the disease became known as "Shu-i," rat plague, "luan-tzucheng," egg disease, or rather bubonic disease, "piao-she," shooting snake, referring to the rapidly fatal nature of the poison, and "yang-tz'u-chuang," the term commonly applied to the disease in Yunnan.

The first patient I saw was on March 1st, 1894, a young Civil Service cadet, who resided in the heart of the City with a view to learning the Cantonese dialect more readily. The case was severe and typical, but the patient ultimately made a good recovery. I then learnt that a few cases had occurred near his house during the latter part of February. The epidemic gradually spread, and reached its height about the end of May.

In Canton the first cases occurred in a poor neighbourhood near the South Gate: also in another quarter of the City occupied by Mahomedans.

So far as I could gather information, the disease travelled overland from Pakhoi to Canton, being traceable through certain towns in the intervening country. In Pakhoi the disease had been known for quite 30 years prior to the outbreak in Canton, but little attention was drawn to it until Dr. Lowry's report in 1882 (*vide* Customs Reports XXIV. *et seq.*) The most likely class to spread the disease would be traders and coolies carrying merchandise. To Pakhoi the plague probably spread from Yunnan, where it was first prominently brought to notice by the severe epidemic of 1871 during the great Mahomedan rebellion. There is no reliable evidence to show the route followed by the plague from Yunnan to Pakhoi; possibly through Kwangsi or the borders of Tonkin.

At the time of the outbreak in Canton (1894) it was suggested that the plague had been imported from Pakhoi by trading vessels, but I consider this improbable. There is a considerable direct trade between Hongkong and Pakhoi both by steamers and junks, and had the disease been carried in this manner one would have expected an outbreak in Hongkong prior to that in Canton, whereas the reverse was the case.

Reliable information as to the extent of the prevalence of the plague in Canton is difficult to obtain, but apparently it has been endemic since 1894, with severe epidemics in 1896 and 1901.

Yes, when I visited the houses in the first affected portion of Canton in March, 1894, the inmates remarked on the large number of dead rats preceding the disease in human beings. Later on the appearance of affected rats in portions of the City hitherto immune was the signal of the approaching disease, and residents who could afford to do so moved to the suburbs or went to live in boats moored in the river. Many in the latter case securing immunity. In Canton there is a very large boating community, and amongst these I heard of little or no plague.

10. During what months does the plague prevail?

Plague prevails most freely during the moist weather between the winter and summer. A few cases are usually noted in March, and increase in frequency to June; with the advent of better and drier weather, the disease declines, and by August the epidemic may be regarded as at an end.

11. What influence, if any, has rain on its prevalence?

- (a.) Slight rain.
- (b.) Heavy shower.

The rainy season in Hongkong commences with the advent of the S.W. monsoon, and extends over May, June and July with the heaviest rainfall. These months correspond with the maximum prevalence of plague, but this may depend more on the mild temperature during April, May and June, extremes of heat and cold being apparently inimical to the spread of the disease. Both slight rain and heavy showers favour the prevalence of plague. Moisture is probably an important factor in its spread, but I think also the crowding of the Chinese in their houses during wet weather, and the exclusion of light and air by closing doors and windows, have also something to do with this prevalence. I remember in the Canton epidemic of 1894 the general expectation was that the disease would abate as soon as a copious rainfall came flushing the streets and drains, but although this occurred during May, and the beginning of June, placing many streets under water, the disease became as rife as ever.

12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness?

I have seldom or ever seen a mild case or so called "pestis ambulans" among Chinese. A Chinaman, however, seldom consults a European doctor either in hospital or private practice, unless he is rather seriously ill, and thus, although such cases might occur, they might not come under our notice. Europeans, on the other hand, are often unduly alarmed about any glandular enlargement, and seek advice accordingly. I have treated many cases of enlarged and tender glands in Europeans usually by excision, but such are usually malarial adenitis, indolent buboes of specific origin and adenitis secondary to skin eruption, boils, etc., in debilitated patients. These occur at all seasons of the year, and have no apparent relation to plague.

13. Do you know of other animals besides rats suffering from plague, if so, what are they?

During plague epidemics many animals die, such as pigs, poultry, etc., but whether the actual disease is plague or a distinct epidemic prevailing concurrently, I cannot, from lack of observation, say.

14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak?

Epidemics amongst pigs are frequent in South China, but are more probably swine fever (typhoid) than plague. In Hongkong there are frequent outbreaks of a disease amongst cattle. It is usually called rinderpest, but may possibly be a separate disease. It was first observed in March, 1896, and proved very infectious and fatal, especially amongst Australian cows in the Dairy Farm.

15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease?

In my opinion the main factors in the spread of plague are:—

- (a.) Rats contaminating food and carrying the disease from infected to healthy areas. Wherever plague has prevailed the association of these rodents with its spread has been noted, and more recently careful bacteriological observations show that the relationship is cause and effect. Wherever a plague-infected rat is found, plague may soon be expected in that locality.
- (b.) Overcrowding. This condition is more marked in Hongkong than in most Chinese cities. Owing to the mountainous nature of the island there is but a small fringe of level ground facing the harbour whereon to build, but on this ground and as far up the mountain side as the slope will permit, houses are crowded together. Built under the lee of the mountain and thus cut off from the free play of the summer winds, separated by narrow streets and constructed with small stairs and passages, these houses afford little entrance to fresh air and sunshine. Land is dear, and hence houses of two or three storeys are common as compared with Chinese cities on the mainland. The number of inhabitants to the acre in Hongkong exceeds by a long way that of any city in the world. Where the population is thus huddled together with insufficient light and air, it can readily be understood how a plague-stricken patient affects the other inmates unless speedily isolated. In the earlier days of the Colony houses were too often run up with an utter

disregard of sanitary principles. However since plague became endemic much has been done to remedy this neglect. Ordinances have been framed to regulate the style and structure of the house, the amount of cubic feet of air for occupants, the height of buildings with reference to the width of the streets, etc., and with regard to the more recent buildings there is probably little to complain of on the score of sanitation.

(c.) Filth. By affording a soil wherein the bacillus may lie dormant, filth undoubtedly plays an important part in the propagation of plague, but probably may, as compared with the two previous causes, be regarded rather as an indirect cause: as compared with the majority of cities in China, Hongkong and even Canton are comparatively clean.

(d.) Drainage. Except in so far as drains harbour rats during dry seasons, I am inclined to believe they play little or no part in the causation of plague. Otherwise how can one reconcile the fact that a city like Victoria (Hongkong), with a European drainage system, suffers as severely from the ravages of plague as Canton, where there is no drainage system, unless one applies that name to the open ditches and cesspools and the gutters running under the flagstones of the streets.

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16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each.

17. Further Remarks:—

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The consideration of the causes of plague naturally leads one to ask what measures should be adopted to mitigate or stamp out the disease? As regards cities in the Empire of China there is, to anyone conversant with the conservative and apathetic nature of the people, and the greedy and rapacious officialdom by whom they are governed, little improvement to be looked for. Like floods and typhoons, they regard the disease as a visitation of the gods and not as the penalty exacted for some violation of the laws of nature. In the epidemic of 1894 their efforts were confined to processions and fireworks, and since then, I am doubtful if they have done anything to seriously grapple with the cause or spread of the disease. Possibly in time it may gradually die out as it has done in Europe, Egypt and other countries where it once had a home. In Hongkong much has been done in the way of cleansing houses, exterminating rats, house to house visitation, and the isolation of infected cases, but much has yet to be accomplished. It seems to me that overcrowding is the principal factor and the most serious to cope with. Most necessities of life are dearer in Hongkong than in the cities of China, but house rents are abnormally so. For the poorer Chinese more houses are required, but who is to build them? With the increased cost of labour and materials during recent years, and harassed continually by vexatious building ordinances, contractors and landlords are beginning to fight shy of building this class of house. The question is, whether or not the time has not arrived when the Government should take on its own shoulders some large schemes for resuming insanitary properties and erecting proper buildings in their stead, and for building similar houses to the east and west of the City and so inducing the population to spread out. Possibly if good and cheap travelling facilities were afforded, as by a system of tramways from east to west, the Chinaman might prove less reluctant to move from the centre of the City than he is at present; such a scheme would be expensive, but probably not more so in the long run than the annual expenditure incurred in combating the disease and the loss to the Colony through quarantine by other ports. It takes however a good deal of faith to see Hongkong perfectly free from plague. It produces nothing within itself, food supplies and labour come from outside. The Colony cannot exist without Canton. When one sees as many as 1,600 native passengers disembarking from one river steamer, irrespective of hundreds arriving daily by other steamers and junks, one can realize that so long as plague prevails outside, so long in spite of rigid inspection there is risk of cases occasionally filtering into Hongkong. The prevalence of plague in our midst is a matter that concerns every resident, and if we cannot hope to completely eradicate the disease, we ought at least to support any scheme that affords a reasonable prospect of ameliorating the state of affairs that has existed during the past eight years.

14.—HONAM and SIU LAM. (Opposite Canton.)

Population: Honam 400,000; Siu Lam 300,000.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. H. K. Shumaker. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Honam—same time as in Canton. Siu Lam—1901. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | To best of my knowledge not. |
| 6. Where was the plague imported from? | Honam—Cannot say. Siu Lam—From Shek-ki (Prefectural City of Heungshan.) |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Honam—Cannot say. Siu Lam—(a.) By water traffic; (b.) No special class. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Honam—So far as I have knowledge 1898, 1899, 1900, 1901. (1902, January to April.) Siu Lam—No recurrence this year. |
| 9. Was the plague outbreak preceded by a rat mortality? | Honam—Yes. Siu Lam—No. |
| 10. During what months does the plague prevail? | January to June inclusive. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Warm rains, whether light or heavy, in my observation, have always been followed by an increase of disease. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes—but in these cases I have never seen the bubo pass on to suppuration stage. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | To best of my knowledge, no. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | ..... |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Since it is practically impossible to state date of first cases, naming the villages seems unnecessary. |
| 17. Further Remarks:— | <p>The main cause of spread of plague, so far as I can understand, is the passage of an infected individual to a district free from the disease, and in which certain conditions exist favourable to development of the infectious matters whether that be a germ or not.</p> <p>In Siu Lam, so far as we can learn, there has never been a death from plague, save of individuals who came hither already sick with disease. In a somewhat extensive experience in Honam I have never seen or known of a second case in a house which was well ventilated and in which the rooms occupied by victims of disease admitted direct rays of the sun. Am inclined to believe that the infection of plague is like that of enteric fever. That the "poison" after leaving the body of patient is not virulent until it has met certain conditions—chief among these being absence of direct sunlight. The Chinese assert that blacksmiths and founders never take plague—artificial dry heat would thus seem inimical to development of the disease. On this point, <i>i.e.</i>, the influence of dry heat (sun's), it may be said that Siu Lam is not closely built and is exceptionally well drained, few, if any, houses but have sunlight entering at least two sides and by skylights. Travel, moist heat with absence of sunlight, so far as I understand the matter, are the causes of the spread of plague.</p> |

15.—FATSHAN (S. W. of Canton).

Population : 500,000.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Drs. Wm. I. W. Anderson and Anton Anderson. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | March to June, 1894. |
| 3. Was the plague recognised as a new disease? | Yes, in Fatshan. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | Attacked the bare-footed classes, like labourers and servants. |
| 6. Where was the plague imported from? | In 1894. Uncertain, probably from Canton. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men, such as traders, tailors, etc.? | Probably by water, as all traffic is by water. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Every year in the Spring. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | March, April, May—may begin in January and go on to end of June. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Slight rain apparently increases the number of cases.
(b.) Heavy rain causes apparently diminution of cases. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and walks about with a bubo during his illness? | Yes. Patients would often walk about several days and then suddenly die. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | In 1893, 1894, 1895, disease raged amongst water buffaloes, and the cattle imported into the Canton Dairy. Specific nature not ascertained by us. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | { 1. That it does not travel faster than man.
2. Tends to follow all trade routes.
3. It is inoculable. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Almost all towns and villages have cases. Superstitious fears prevent foreigners getting at the truth. |
| 17. Further Remarks:— | We have observed that the "Pneumonic" form of the disease attacks the wealthy classes, who are less liable to exposure and consequent inoculation. The cold dry winter (North wind prevailing) causes the hands and feet of the exposed serving classes to crack, and fissure. This class upon the break up of the weather and onset of rainy season suffer most heavily and generally from the ordinary bubonic form. Fatshan is a town situated South-west of Canton about 15 miles distant; is now approachable by steam-launch. Foreign doctors have been resident in Fatshan for the past 21 years. |

16.—I reside in Hongkong, but I spend about one-fourth of my time in the country, travelling over 3 or 4 districts—
San Ning, San Nī, Yan Ping, Hoi Ping and San Hing.

The Population of the country region where I travel is from 3 to 4 million of people.

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| 1. Name of Province and Name of Doctor replying. | Canton Province. Rev. C. R. Hager. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | As far as I can recall there was no outbreak of the plague in the above-mentioned districts until after it appeared in Hongkong—1894. |
| 3. Was the plague recognised as a new disease? | It was. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | I heard that in 1890 a large number of people were dying in Mui Luk near the French Possession Kwong Chau Wan, which, I think, must have been the plague. |
| 5. Did the first cases attack any special classes of men or houses? | As far as I know the first class to be affected were shopmen. |
| 6. Where was the plague imported from? | I think that the cases mentioned in the region spoken of above were either imported from Canton or Hongkong, but, as I said before, I believe it came to Hongkong first from Mui Luk and to that place from Yunnan. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | I should say both, though it is highly probable that it was first introduced into Mui Luk by road traffic and carried here by traders from Yunnan. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | In some places the plague recurs yearly, in others every other year, and in some places there is an interval of several years. |
| 9. Was the plague outbreak preceded by a rat mortality? | The rats usually are affected first and die before the Chinese are affected. |
| 10. During what months does the plague prevail? | The plague usually prevails from February to July or even as late as September and October, but never more than about one or two months in one place. If a place is attacked in the first of the season there will be no plague later on or very few cases. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Slight rain increases it.
(b.) Heavy showers have a tendency to wash the germs away. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | In one village I have noticed a number of persons affected with slight glandular swellings which I attributed to a slight form of plague, with little or no fever. This occurred in the autumn months. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Have not made any observations under this head. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Pigs and cattle are often affected with an illness in the country, but whether this always precedes plague, I cannot say. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Uncleanliness, want of room, want of fresh air, and want of sunlight. I think overcrowding is sometimes worse than dirt. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | The number of villages and towns affected in my district are many, and constantly increasing, but I wish to affirm that there are many places where not a single case has occurred, and these places are by no means cleaner than some of the rest where plague occurs. |
| 17. Further Remarks:— | I wish further to say that the plague in the country villages or markets has never been as virulent as in Hongkong or in Canton. It is only occasionally that one hears of persons leaving the village on account of this scourge. During the month of March, however, of the present year I have heard of several villages in the San Ning district being so seriously attacked that the villagers erected matsheds in the fields and moved their families there. |

17.—SWATOW (Latitude 23° N.; longitude 116° E.).

Population: 30,000 to 35,000.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. H. Layng. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | March, 1895. |
| 3. Was the plague recognised as a new disease? | Yes; often called at first by Chinese as the " <i>Hongkong Disease</i> ." |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | Yes. One case in 1894, after the arrival in Swatow of many hundreds of refugees from Hongkong. |
| 5. Did the first cases attack any special classes of men or houses? | Not as far as I know. |
| 6. Where was the plague imported from? | Hongkong. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By water traffic. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Each year since 1895. Epidemic in 1898 only. From early February to July, cases are heard of. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes, in epidemic of 1896 and 1898. |
| 10. During what months does the plague prevail? | End of January or early February commences, maximum in April and May and early June, then subsides, usually quite clear early August. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Have no certain facts or data. My impression is that a few days after heavy rains, there is an increase of cases, due, I have thought, to the rain detaining people in their houses. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Pigs are reported as sufferers, but I have not seen any. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | I do not know. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | The introduction of plague-stricken people into badly ventilated, sunless and filthy houses crowded with human beings and often with a few pigs in addition. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | <i>Vide</i> map sent. Exact month I do not know. |
| 17. Further Remarks:— | |

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. A. Lyall. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | 1895. As I was absent on furlough when the first epidemic occurred, I refer you to Dr. LAYNG's paper. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | ..... |
| 6. Where was the plague imported from? | Hongkong. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | ..... |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Cases of plague have occurred every year since the first outbreak. Sometimes it has appeared as early as January, but oftener in February. |
| 9. Was the plague outbreak preceded by a rat mortality? | It is generally recognised by the Chinese that rats die first. During that year I have often been told that " <i>men are dying in such and such a street, rats have begun to die in another street, men not yet.</i> " |
| 10. During what months does the plague prevail? | April and May are the months of its greatest prevalence. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) None, so far as I know.
(b.) Is followed by an increase, at least a temporary increase. The disease quickly disappears with the hot dry weather which sets in towards the end of June. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have not observed this. In Swatow there is more or less prevalent during the Spring months, especially among children, a mild kind of glandular fever. The patient is well in two, three or four days. Clinically I do not think it is plague. It seems more to resemble glandular fever, of which disease we occasionally get typical cases. This mild glandular fever I have seen cases off and on since I came to Swatow 23 years ago. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. I have heard of a cat dying in a house where plague broke out, but I have never been able to satisfy myself of the accuracy of these stories. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | To my knowledge there have been two epidemics of murrain among cattle during the last few years. The Chinese tell me that there has been no greater amount of sickness than usual among pigs. Epidemics of pig disease are common, of which they recognise two kinds: (a) with diarrhoea, (b) a disease in which the skin becomes " <i>red.</i> " |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | From house to house by rats, from one place to another by infected individuals. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | See Map. |

If you will look carefully over the map you will notice that there seem to be two ways by which the plague spreads. One is by radiating from centres into the neighbouring villages, and the other is by making a "jump" as it were over a considerable distance to some town beyond without infecting intermediate places. Then the new place forms a centre of infection by radiation and "jumping." Thus to the North you will find Ung Kug infected and none of the villages between it and Swatow being yet infected. From Ung Kug it has spread to Chia-na, but has not gone inland yet. To the West, Mai-On, a town 60 miles from Swatow up the river, was the first place infected, and it was infected not from Swatow, but from Hwei-lai, between which towns there is a large carrying trade of salted fish. One of the coolies engaged in the portage contracted the disease and died at Mai On. From Mai On it spread to Li On; near Swatow there is a series of villages, Tsan-phon, about eight miles from Kuh Yang. In this series of villages in the same year one was infected from the Chhiah-lian (between which villages there is a large trade in salted vegetables, and, as in Mai On, one of the coolies contracted the disease in Chhiah-lian) and one from Swatow. You will also notice that this year the plague has "jumped" from Kuh Yang to Thung Khe, a distance at least of twelve miles, and it has already during this one year infected two or three neighbouring villages. To the South and West. —There seems to be no plague from Cup-chi westwards. Kong-pheng in the West was infected from Hongkong—a man came from Hongkong, developed plague and died. Next year it appeared in epidemic form. The Chinese say Kong-pheng is a dirty town, so it must be dirty. From Kong-pheng the other places in that region have been infected. The only village in the estuary so far infected is Chhi-tshan. This village is the trade terminus for Tua-na. Boats carry goods to Chhi-tshan, and the goods are then carried by road to Tua-na. It has been infected secondary to Tua-na. With regard to question 15,—what I mean is this, a good many cases where plague has broken out in a Chinese house, I personally know that dead rats have been found behind furniture, etc. And it does seem that from one place to another, one way at least of carrying the plague is by infected individuals. At the same time I must say that in scores of cases when infected persons have been carried to their homes and died, no epidemic has resulted. *Re Thung Khe.*—I sent to a pupil for particulars. The plague is rife in two villages about two miles distant, and rats and mice are dying in Thung Khe itself, but no person has been infected yet. Perhaps I should explain that in this part of China, villages are often arranged in groups under a common name and that each village has its own special name in addition, thus "Thung Khe" is not only the name of a village, but of a group of villages lying around it. The condition of affairs is this—two of the outlying villages are infected with plague, but that in Thung Khe itself rats only are dying.

I hear also from another pupil about a group of villages called Tek Keè, 5 miles from Kieh-yang. This year a native of one of the villages contracted the disease at Chao Chow-foo, was taken home, and died. Since then a few more cases of the disease have occurred. It will be interesting to see if it becomes epidemic in Tek Keè next year. Though only 5 miles from Kieh-yang where the plague has been very bad for a few years, it has escaped, and now it has been infected from Chao Chow-foo at least 30 miles distant. It is only in the villages one can hope to trace the origin of the infection. Towns and cities are absolutely hopeless.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. A. K. Scott. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | April, 1895, if I remember correctly. |
| 3. Was the plague recognised as a new disease? | No. It was known to have been endemic in Pakhoi for years and recognised as the same disease as was epidemic in 1894 in Hongkong. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first case attack any special classes of men or houses? | Houses in crowded and filthy localities were first attacked. |
| 6. Where was the plague imported from? | Hongkong and Canton. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By water traffic. No special class of men observed. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | To some extent the same months each year since. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | March, April and May (in March only a few cases). |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Humidity increases its prevalence.
(b.) Heavy rains increase its prevalence by driving coolies into the infected houses to sleep. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | I know of none. The Chinese say insects and worms suffer from plague. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not that I am aware of. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Rats and infection and inoculation from persons suffering with the disease. Nurses sleeping in the same room almost always contract it. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Swatow, Chow Yang, Kih Yang, Chóa Chow Fu, Sua Pon, Am Pon, etc., etc., etc. I cannot give the year and month of the first infection. |
| 17. Further Remarks:— | Living night and day in the open air on the hill tops markedly relieves the severity of the disease. From personal observation I am led to believe that the cities and towns infected in the Swatow district are those which have the greatest number of coolies returning from foreign parts, and where streets and houses are totally without efforts towards sanitary regulations. April, May and the first half of June last year showed a larger number of deaths than any year preceding. The existing plague conditions were in no way different except the unusual dampness. The city of Ung Kong (an intolerably filthy city) lost a tenth of its population if one may trust Chinese statistics. The bedding and clothing of the infected tend to spread the disease as the Chinese will destroy neither unless compelled to do so. |

20.—CHAO-CHOW-FOO (viâ Swatow).

Population : 200,000.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. P. B. Cousland. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Spring 1898, probably April. |
| 3. Was the plague recognised as a new disease? | Yes, although the native practitioners maintain it is described in their medical books. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | I was on furlough in 1893. |
| 5. Did the first cases attack any special classes of men or houses? | No information. |
| 6. Where was the plague imported from? | No information. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | No information. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | First outbreak 1898 (bad); 1899 (light); 1900 (bad); 1901 (light); 1902 (beginning). |
| 9. Was the plague outbreak preceded by a rat mortality? | It has been in all the outbreaks I have been acquainted with. |
| 10. During what months does the plague prevail? | March, April, May, June. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | No reliable figures. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have not met with such a case. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not that I ever heard of. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | ..... |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | Details sent to Dr. LYALL for incorporation in his map. |
| 17. Further Remarks. | |

Chao-chow-foo with its 7 gates. In 1898 and 1900 the outbreak was widely distributed in the City. In 1901 one street only was affected in 40 shops *outside* Gate I. (marked in red), 60 or 70 persons died. The outbreak was caused in this way:—A man with the plague came from Swatow, 30 miles away, and wished to stay with a relative outside this Gate. The latter refused, and the man went to a hill outside the City (3 miles away) where he died. His clothes and bedding were brought back to the relative's place and he took ill that night (infected on this man's first visit (?) and therefore not through rats?). This was in the beginning of May. The outbreak lasted about 2 months and did not enter the City. This street is under water several times a year when the river rises: in 1901 it did not rise till July, when the outbreak had almost ceased. 1902 (this year) plague began about the 10th of March just inside Gate I, and spread along 3 streets (marked blue). In March (date unknown) it also broke out in at least one place inside the City and outside Gate II. This is the position of matters now—the beginning of April. The spread of the plague passed this Hospital in 1900 and was clearly traced. First came the death of the rats in the shops, day by day, nearer and nearer, followed a few days later by cases of plague among the shopmen; so the stream of rats and then human fatalities flowed along past the Hospital. The street is on the top of an embankment and has no side branches, so the progress was not complicated. *There were no rats in the Hospital and no cases.*

21.—AMOY (Latitude 24° N. ; longitude 116° E.).

Population : 100,000 Chinese.

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| 1. Name of Province and Name of Doctor replying. | Fuk-kien. (No Signature.) |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | 1895. |
| 3. Was the plague recognised as a new disease ? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances ? | No. |
| 5. Did the first cases attack any special classes of men or houses ? | No. |
| 6. Where was the plague imported from ? | Hongkong |
| 7. Was it introduced by road traffic or by water traffic or by both ? and by any special class of men such as traders, tailors, etc. ? | Steamers. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared ? | Every year since 1895. |
| 9. Was the plague outbreak preceded by a rat mortality ? | Yes. |
| 10. During what months does the plague prevail ? | January to July. |
| 11. What influence, if any, has rain on its prevalence ?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Increase.
(b.) Tendency to decrease slightly |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness ? | A few. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they ? | The Chinese say that a few cases of "pig plague" and also a few cows have died of the plague. I do not believe it. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak ? | |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease ? | Carried by rats and infected individuals. |
| 16. What villages and towns in your district have been infected ? Please state year and, if possible, the month of the first infection against each. | All of them. More females die than males. |
| 17. Further Remarks. | Plague follows trade routes. |

22.—CHANGPOO (AMOY).

The Town is about 30 miles South of Amoy and 15 miles from Seaboard. Population : about 25,000.

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| 1. Name of Province and Name of Doctor replying. | Fuk-kien. Dr. J. M. Howie. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | April, 1901. |
| 3. Was the plague recognised as a new disease? | By all Chinese in this region. Names of the disease are all new and not found in old books. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | Only one or two cases in Amoy (not my own cases). |
| 5. Did the first cases attack any special classes of men or houses? | The first cases were three women—all died. |
| 6. Where was the plague imported from? | From a village $1\frac{1}{2}$ miles down river which passes City. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | To within a mile of City by river; then, road. <i>Only a suspicion</i> by fish carriers and sellers. Proofs vague. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | No other outbreak. |
| 9. Was the plague outbreak preceded by a rat mortality? | As it lit up in various districts of City, it was always preceded by a rat mortality. |
| 10. During what months does the plague prevail? | In this City from April till about end of June. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Slight rains none, so far as I could see.
(b.) Plague stopped with heavy flood. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have met one or two; bubo generally suppurates; man does not take to bed. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | During plague, pigs had fever and buboes, ending in death. People always ate such brutes—no waste. Dogs and hens not quite sure. Cattle generally have plague. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Have not seen or heard. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Proximity, i.e., close touch with rats, fleas, and filth. Main cause, inoculation, e.g., flea, bug, louse or mosquito bite. Even rat-bite or pig-bite if these animals are infected. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Large percentage within radius of six miles of City. It still lingers here and there. |
| 17. Further Remarks :— | My opinion can be of little value, because out of about 160 cases seen in connection with this Mission Hospital, I only attended half of these. Of the 160 only one was treated within the hospital—he only passed one night and next morning was sent home. All cases were treated in these homes under the <i>worst</i> of conditions. Carbolic acid from first to last was the principal drug used. The results were doubtful, but I can send you all papers if desired. |

23.—CHANGPOO, FUKKIEN, SOUTH CHINA—Continued.

Population : See paper "Plague at Unsie, 1902"—below.

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| 1. Name of Province and Name of Doctor replying. | See paper. Dr. J. P. Maxwell. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | See paper. |
| 3. Was the plague recognised as a new disease? | No such disease is known to any living inhabitant nor have I been able to find any traces or traditions of a previous epidemic. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | See paper. |
| 5. Did the first cases attack any special classes of men or houses? | See paper. No special class attacked. The evil living and debilitated and beggars not specially subject. |
| 6. Where was the plague imported from? | See paper. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | See paper. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | April 12th, 1902. Heard of first definite case this year. Septicæmic. |
| 9. Was the plague outbreak preceded by a rat mortality? | See paper. |
| 10. During what months does the plague prevail? | Since the outbreak of 1901 has been endemic in some of the villages round Changpoo. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | See paper. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes, and by no means uncommon. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | See Further Remarks below. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | See Further Remarks below. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | See Further Remarks below. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | See Further Remarks below. |
| 17. Further Remarks:— | It is extremely difficult for me to answer these last few queries in a truly scientific way. There is no doubt that at these times there have been epidemics among pigs, buffaloes, fowls and dogs. As to pigs what the Chinese call "pig plague" is probably swine fever and is certainly not usually bubonic plague. It is accompanied by lesions of the intestine and fever. But at the same time there have been several serious epidemics of a disease among the pigs of certain villages in which they have died, and I have seen the whole of the lumbar glands enlarged and inflamed clinically like those found in bodies dead of plague. But taking the vast number of pigs in this region the percentage must be very slight. I have been unable to carry out any bacteriological examination and so cannot be positive on the identical nature of the disease. As to buffaloes I am still more in the dark. I know of two places where there were epidemics among these last year. In the one case I strongly suspect rinderpest. In the other I |

am assured that the glands were enlarged, but I did not see the carcasses myself. Dogs occasionally died with glandular swellings during the plague epidemic, but I did not see more than 4 myself. Fowls are said to have died, and I saw one in which all the glands were enlarged and inflamed. But neither dogs nor fowls are particularly susceptible, as I have seen them with impunity eating sputum from pneumonic cases. As to the main causes of the spread of the disease, the Chinese are clear on its associations with rat mortality, and I am equally clear from my own observations. But as to its immediate cause I am getting more and more doubtful about the rat flea theory. I cannot see how we could escape plague. I must have been bitten, in spite of flea-powder, many times by fleas off plague patients, and so must many of my students. The Chinese, especially women, catch their fleas and kill them between their teeth! If they catch fleas with plague bacilli in them, how do they escape? The other day a girl in a village near here brought home a bundle of clothes from a plague village. In a week or so most virulent plague broke out in the house and 9 people died in that house alone. I am at present making more inquiries into this attack, and if you would like them I will send them later on. Rats undoubtedly carry the plague on in some places. I have no doubt that the set of O'chie villages was affected in this way.

PLAGUE AT UNSIE, 1902.

Unsie is a city of about 20,000 inhabitants, of whom about two-thirds live outside the City wall. It has a large junk traffic with all the towns on the coast, and full-sized junks can at full tide come up to a kind of quay adjoining the Unsie suburb. The City is situate at the head of an estuary which narrows about a mile below the City into a river about 50-60 yards broad. Opposite the City itself the river is about 40 yards broad. From the City to the sea is about 10 miles. The sea here forms a large inland basin, called in the Admiralty Charts the "Tongsang Basin."

The City has been in spite of its large coasting traffic entirely free of plague till the beginning of May, 1902. About the middle of April a junk which had rats dying on board arrived at Unsie. Shortly after rats began to die in the end of the suburb which adjoins the quay, and on May 2nd or 3rd plague broke out in the house of a man who lives some 250 yards from the quay. One member of the house had been shortly before in an infected region, but neither he nor those who were connected with him have been in any way ill. Dead rats had been found in the house about a fortnight before.

Several members of this family died of septicæmic plague in a few days. Then it attacked the next house and cleared off every inhabitant. Then rats began to die all over the City and plague began to break out in many locations, though its severity during the first month was confined to the section of the suburb in which it started. Unsie is a low-lying city and is easily flooded. There has been very heavy rain during the last few weeks. But I find on inquiry that the rain at Unsie was intermittent and the City never properly flooded, so that it has not been a proper test of the beneficial effects of thorough flooding. Another point must be noted. The interval between the death of the rats and the attacking of the inmates of the house has been, as far as I can learn, on the average about 20-25 days, though in some cases the interval was about 10-14 days. I am not sure of the accuracy of these figures, and should not place much reliance on them, as the Chinese often grossly exaggerate the length of time between two events. Since the epidemic began many rat deaths have been noticed on board the junks which lie at the quay, but the only case in which I can trace this before the epidemic commenced was in the boat before mentioned, which came from Swatow, where plague is severe at the present time.

The mortality in Unsie since the commencement of the epidemic has not been very severe, only some 300 to 400 deaths.

24.—CHIANG-CHIU, viâ Amoy.

Population: 50,000, about half within and the rest immediately outside the City Wall.

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| 1. Name of Province and Name of Doctor replying. | Fuk-kien. Dr. A. Fahmy. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Summer of 1896. |
| 3. Was the plague recognised as a new disease? | No, although it was new to the present generation. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | No, but if anything the dirtiest and most crowded parts. |
| 6. Where was the plague imported from? | Not certainly known but it had previously occurred in Canton and Hongkong. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Probably through water traffic, but there is no certainty of this. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Ever since its appearance it has never absolutely left us, although at times we thought we were free of it; at the present time there is a slight epidemic. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes, and it has always been observed that either before or concurrently with the pestilence rats died in numbers in houses or streets which were afterwards attacked. |
| 10. During what months does the plague prevail? | Spring and Summer chiefly, but we are hardly ever free of it. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Could not be certain. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes, I have seen a good many cases of <i>pestis minor</i> . |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Concurrently with an epidemic of bubonic plague last Summer there was a "cattle plague" which carried off large numbers of cattle. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Rats are probably the chief agency in the spread of the plague. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | A large number of villages and towns were attacked after the appearance of the trouble here, but a good many escaped. At the end of last year and in the Summer of that year towns and villages which were hitherto free were attacked, and some with a virulent form of plague. |
| 17. Further Remarks:— | |

25.—CHIN-CHIEW.

Population : Say half a million.

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| <p>1. Name of Province and Name of Doctor replying.</p> <p>2. The month and year in which the first outbreak of plague occurred or made its first appearance.</p> <p>3. Was the plague recognised as a new disease?</p> <p>4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances?</p> <p>5. Did the first cases attack any special classes of men or houses?</p> <p>6. Where was the plague imported from?</p> <p>7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.?</p> <p>8. In what year since the first outbreak and in what month has the plague re-appeared?</p> <p>9. Was the plague outbreak preceded by a rat mortality?</p> <p>10. During what months does the plague prevail?</p> <p>11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower.</p> <p>12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness?</p> <p>13. Do you know of other animals besides rats suffering from plague, if so, what are they?</p> <p>14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak?</p> <p>15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease?</p> <p>16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each.</p> <p>17. Further Remarks :—</p> | <p>Fukkien. Dr. B. L. Paton.</p> <p>Spring of 1894.</p> <p>Yes.</p> <p>First case was one of pneumonia; was said to have got chill on his way up from Amoy, died after a week's illness; and about seven others, either in the house or visitors from a distance, were infected and died.</p> <p>In some houses the slave girls were first attacked.</p> <p>It is likely it was imported from Amoy.</p> <p>Probably by both. It is said that the first cases were those who had gone down to Amoy for employment and came back to their homes ill with the plague.</p> <p>It has appeared every year after short breaks of a few months' duration.</p> <p>In some outbreaks, yes. Very often the outbreak in a house was preceded by a rat mortality.</p> <p>It began again this year in February after a break of two or three months.</p> <p>Have not noticed any special influence.</p> <p>Yes.</p> <p>No.</p> <p>Do not know of any.</p> <p>That the rat has a good deal to do with it, perhaps by contaminating the food if not by actual contact.</p> <p>I believe scarcely a village has escaped.</p> <p>Speaking to a native of the frequent visits of the plague in this region he said: "Yes, it is like the tax-collector; you never know when or where he will pop in." The first I heard of it was in 1894, when there was said to be a disease outside the new Gate which the people spoke of as "Spitting Red disease." The mortality was very great. No doubt it was pneumoic plague. The first case I saw in the City was the patient I have referred to above, who came up from Amoy ill. I treated him for pneumonia. The case came into my hands after two or three days of native treatment and I was not very clear about it. The patient died within a week. His wife took ill and died in about the same time. Then the mother. In the case of a good family, the disease seems to have begun with a slave girl, then a daughter-in-law, then the old mother, then a son and another daughter-in-law, then the old father. The native doctor who attended also took ill and died. The plague seems at first to have been a good deal confined to certain streets. In one of these streets I attended a girl who died of it. There was no recurrence in that house till almost exactly another year had passed, when another girl took ill and died. In one village outside the City where there was plague when I was at home on furlough, I heard on my return that one man had contracted it and died by eating a rat, which had fallen from the rafters in a dazed condition. The other members of the family did not partake. The rat was cooked before being eaten. I think his idea was that it might be an antidote to the plague. I knew the man well.</p> |
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26.—NGU CHENG, HOK CHIANG.

Population: 12,000.

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| 1. Name of Province and Name of Doctor replying. | Fuk-kien. Miss L. M. Masters. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | March, 1900. March 14th, 1900, was the date of the first cases in Hok Chiang that I was called to see. |
| 3. Was the plague recognised as a new disease? | It was a new disease in Hok Chiang. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | Yes, two years ago in Foochow while engaged in medical work there. |
| 5. Did the first cases attack any special classes of men or houses? | Mostly fishermen, and houses in low, crowded localities. Many farmers also have died of the disease. |
| 6. Where was the plague imported from? | Not positively known, but it is believed that it was imported from Hing Hua. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Not positively known, but was most probably from road traffic and by traders and by persons leaving Hing Hua to escape the disease. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | 1900, 1901, 1902. Has been present in some parts of Hok Chiang in every month of the year, but more prevalent in March, April, July and August. |
| 9. Was the plague outbreak preceded by a rat mortality? | It was; and in every town where the plague has visited it has been preceded by a rat mortality. |
| 10. During what months does the plague prevail? | In every month of the year. Last year, also 1900, it was worse during July and August. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | The amount of rain has not seemed to have any influence. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have known of only one case, but this case suffered greatly, but was determined she would not die as she was the only member of the family left. Four had died in the family before she was taken ill—she recovered. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | One of my household pets—a fine large cat—had the bubo and symptoms of plague after tasting of a rat that had died of plague. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | I think not. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | <p>A. Spreading from town to town:—(1.) Travellers sleeping on bedding rented from the pawnshops, which came from infected houses. (2.) Eating sweet potatoes in which rats had died. (3.) Frightened natives leaving their infected homes and villages to seek a place free of the plague.</p> <p>B. Locally:—Overcrowded, poorly ventilated houses. Remaining too long in the sun on the hill and not careful to wash their hands and face frequently when waiting on the hill.</p> |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | |
| 17. Further Remarks:— | The natives say that the plague first visited Hok Chiang in 1897 during the summer months. At that time it first visited Ngu Ka and from there to Ngu Cheng. No other towns were infected at that time. In reply to question 16 cannot give dates—Ngu Ka, 1897, Ngu Cheng, 1897. The plague has not taken any special route in spreading, but has jumped from one infected street in a village to a remote street in the same place, so it is impossible to locate any route of the extension of the disease. |

27.—FOOCHOW (Latitude 26° N., longitude 119° E.).

Population: 60,000.

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| 1. Name of Province and Name of Doctor replying. | Fukien. Dr. Ellen M. Lyon. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | It appears so slowly and indefinitely it is hard to tell, about 1897 in May. |
| 3. Was the plague recognised as a new disease? | By the natives, yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | My first case was in 1897 or 1898 in a small village; many deaths in the village; more than ordinary clean village. |
| 5. Did the first cases attack any special classes of men or houses? | The poor. |
| 6. Where was the plague imported from? | It came up the coast overland from Amoy <i>via</i> Hing Hua and Hok Chiang. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Road traffic slowly from village to village. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Each year in spring months. Last year most. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | May, June and July. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Increase it in the warm rain, slight rains. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Have not seen much. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | I have heard of a pig. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | ..... |
| 15. What opinion have you formed from your own observations as to the main cause or causes of the spread of the disease? | Filth, bad drainage. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | About all villages. |
| 17. Further Remarks:— | ..... |

28.—PAGODA ANCHORAGE (FOOCHOW) (Latitude 26° N.; longitude 119° E.).

Population: Probably 20,000.

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| 1. Name of Province and Name of Doctor replying. | Fukien. Dr. H. T. Whitney. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | It has been known in this region for many years, but has not been noticed in and about the Anchorage till about six or seven years ago. |
| 3. Was the plague recognised as a new disease? | Yes, by most people, about seven years ago. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | As far as known it begins in low, dark, moist, dirty places, and spreads to places where it would not naturally appear, by moving infected people, rats, etc. |
| 6. Where was the plague imported from? | Not known, but thought by some to have come from ports south of us. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Not known, but probably overland from Amoy if it entered from without. |
| 8. In what year since the first outbreak and in what months has the plague re-appeared? | Every year for six or seven years. Appearing as early as April, and extending, when epidemic, on into the winter. |
| 9. Was the plague outbreak preceded by a rat mortality? | The dying of rats is the regular precursor at the outset. |
| 10. During what month does the plague prevail? | June, July and August usually the most prevalent. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Have no definite data, sometimes a heavy rain increases it and sometimes diminishes it temporarily. But I am inclined to think in the former case it is because the water cannot run off, and in the latter the sewers, etc., are flushed and cleansed. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Do not know of any. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Do not know of any. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Rats and transferring of plague patients. Mosquitoes and fleas have been suspected, but have no proof. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | The district City (Chongloh) and some 20 villages in the district, within a radius of 15 miles, have become involved within the last 6 or 7 years, from 4 or 5 to 15 or 20 dying in each village, though not in the same year, and in most cases it was transferred by plague patients returning home from Foochow. |
| 17. Further Remarks:— | ..... |

29.—NODOA, Hainan Island (Latitude between 18° and 20° N. ; Longitude 108° and 111° E.).

Population : 10,000, including surrounding villages that depend upon this market.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. E. D. Vanderburg. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Spring and fall of 1900 and 1901. |
| 3. Was the plague recognised as a new disease? | No, although natives say it has been several tens of years since they were before troubled with it. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | The cases I went to see were of all classes. |
| 6. Where was the plague imported from? | From a market 12 <i>po</i> from here on the coast, or near it from a market called Fan Tia, and another Lok-ki. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By road; we have no water traffic here. No special class. |
| 8. In what year since the first outbreak, and in what month has the plague re-appeared? | It is prevalent now only $\frac{1}{2}$ day's journey from here (March 31st, 1902). |
| 9. Was the plague outbreak preceded by a rat mortality? | It was. The natives who left their villages in a body and came to our market say the rats would be found in the morning dead on the floor, and that they know it was plague, and hence ran away. Half of their village had died of it before they came. |
| 10. During what months does the plague prevail? | Spring and fall of February, March and September. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | The worst of the Spring siege, i.e., the mortality of the Spring epidemic, seems to be less after the heavy rains come. In the fall the very cold weather seems to affect mortality in same way. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have seen very mild cases, but they are generally so scared that they take to their beds as soon as bubo appears. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | I have not noticed anything like it in any other animal except in case of a horse which a man brought here with swelling at side of jaw, which he said was plague. I doubted it. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | The year the plague first appeared the natives lost a lot of cows with small-pox. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | I am sure that rats are not the only cause of infection. Else how would it spread from village to village when the people carry only a bundle on their shoulders and in a place like this, where there is absolutely no water traffic? |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Nodoa, 1900 in Spring few cases.
" 1900 in fall " "
" 1901 in Spring " "
" 1901 in fall " " |
| 17. Further Remarks:— | Fan Tia, near here, at same time badly infected, many deaths. 1902, March—Ag Sey, No Bach Siki and Mi Lian Siki—these latter places I fear are on no map. They have both plague and cholera in these latter places now, and I am told by Chinese that the plague is very deadly in all three towns. |

30.—LIEN CHOW, N. W. part of Kwangtung Province close on the (Southern) border of Hunan.

Population : 50,000, many villages throughout the district.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. E. C. MACHLE. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | No outbreak of plague during my twelve years of residence here. None in the memory of the Chinese. |
| 3. Was the plague recognised as a new disease? | None. |
| 4. Had you met with any cases previous to the outbreak, if so, when, and under what circumstances? | Striking out the words "previous to the outbreak" in this question the answer is :—One case—a man of about 40 years of age. |
| 5. Did the first cases attack any special classes of men or houses? | None that I know of. The man entered the Hospital and died about two days afterwards. He was a merchant. |
| 6. Where was the plague imported from? | From Canton. The patient said he had come up from Canton a few days before and that the plague was raging there. |
| 7. Was it introduced by road traffic or by water traffic or both? and by any special class of men such as traders, tailors, etc.? | By water traffic; a trader. |
| 8. In what year since the first outbreak, and in what month has the plague re-appeared? | No other cases. No re-appearance. The disease unknown among the people. |
| 9. Was the plague outbreak preceded by a rat mortality? | ..... |
| 10. During what months does the plague prevail? | ..... |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have seen none. As the Hospital I superintend is the only one for this region, I feel sure the plague does not exist even in a mild form. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | I do not. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | ..... |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Having been associated with the late Dr. J. G. KERR at the Canton Hospital in 1895, I had an opportunity to study up plague cases. I think that germ-infected earth and matter on apparel and other objects brought in contact with broken skin of the body is one cause of spread of disease. Again, insects—as the mosquito, flea, bed-bug, fly and especially the <i>itch mite</i> are some of the main causes. I cannot say of water, air and food transporting it. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | ..... |
| 17. Further Remarks :— | I have made several trips to the Southern parts of Hunan. Have never heard of or seen a case of plague at Kong Wa, Lán Shan, Lam Mo and Ka Wo—the four most Southern districts of Hunan. Have conversed with Chinese in regard to the plague and they know nothing of it. They use the name "plague" for cholera, which swept over this part of the country of Hunan and Kwangtung years ago, coming from the north of Hunan. I can safely speak for the districts of Lien Chow, Lien Shan and Yeung Shan of Kwangtung Province. They are free from plague. |

31.—YEUNG KONG.

Population: 40,000 Chinese.

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| 1. Name of Province and Name of Doctor replying. | Kwangtung. Dr. W. H. Dobson. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | <p>It is not easy to get answers to these from Natives. Foreigners have this year begun residence here. Plague has been here some years and apparently came overland from South.</p> |
| 3. Was the plague recognised as a new disease? | |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | |
| 5. Did the first cases attack any special classes of men or houses? | |
| 6. Where was the plague imported from? | |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, &c.? | |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | |
| 9. Was the plague outbreak preceded by a rat mortality? |  | Dead rats generally numerous just before outbreak. Chinese seem to look upon this as preceding plague. |
| 10. During what months does the plague prevail? | Generally during Spring and early Summer. Late Winter also. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | During my short term in China, I have noticed that the beginning of rainy season seems to be the inception of the disease. A little water (rain) seems to increase the disease. A great deal of rain seems to wash it away. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Have not met with any. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Not that I am aware of. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Filth, dampness (apparently assisting growth of germ), possibly rats <i>per se</i> . The cases I have seen have been apparently from (1) bites of insects (fleas); (2) contamination of open wounds on legs or elsewhere; and (3) through food containing the germ. The last possibly the most frequent and the second next in order. In this regard I would like to call attention to the danger of Chinese wet vegetables both salt and fresh, especially the salt vegetables, which lay where filth may collect. |
| 16. What villages and towns in your district have been infected? Please state the year and, if possible, the month of the first infection against each. | All more or less with exception of small isolated villages. Shui Tung is a noted plague spot. |
| 17. Further Remarks:— | |

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| 1. Name of Province and Name of Doctor replying. | Formosa. Dr. J. L. Maxwell. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | 1896. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | Not here myself. |
| 5. Did the first cases attack any special classes of men or houses? | None. |
| 6. Where was the plague imported from? | Said to be from the North spreading steadily South from Tai Pe'h. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | By road. Possibly also by sea from the Pescadores, where plague was then raging very fiercely. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | 1898, severe; 1899, slight; 1900, very severe indeed, commenced January; 1901, severe, commenced January; 1902, very slight or absent. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes, certainly during 1901, when I observed the disease. |
| 10. During what months does the plague prevail? | January, February, slight; March, getting severe; May, June, very severe; July, improving again. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | Slight showers appear to have no influence. The disease ceases when rainy season is once well begun. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | I have seen a few non-venereal buboes with no evident cause. These have been very few and appear always associated with malaria in a severe form. There has been no definite outbreak of non-venereal buboes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Swine; but I have made no bacteriological investigations. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Yes, as above; also a disease called Rinderpest among the buffaloes, killing great numbers; this prevailed during the 1901 epidemic. The disease is diagnosed as Rinderpest by the Japanese. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Certainly the spread appears connected with the death of rats. I have many times heard that "the rats are dying in such and such a house," and then been very shortly summoned to cases of plague in the same house. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | All the villages in the district have been infected. Sorry I cannot fill in the last half; while as I have stated the City has this year been free, a village, Tiong-to, 10 miles to the South, has been ravaged with the disease, also several other villages in the South, but there appears to be little regularity in the outbreak. |
| 17. Further Remarks:— | I have only been resident here just over a year, so my experience has not been far back enough to answer most of the questions well. As Consular Medical Adviser I wrote a short paper on the treatment of the plague by the Japanese last year which was forwarded to Hongkong. I have also written a more exhaustive paper on the subject of the use of prophylactic injections here, which I have sent to the home medical papers for publication. As it may still be some months before it is published, I should be willing to let you have a copy of the paper still in my hands should you wish it. |

33.—DAITOTEI, near TAIHOKU (North Formosa).

Population ; Taihoku, 7,567 ; Bankha, 23,554 ; Daitotei, 23,270.

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| 1. Name of Province and Name of Doctor replying. | North Formosa. Dr. A. N. Wilkinson. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Was discovered to be endemic by the Japanese directly they came here. |
| 3. Was the plague recognised as a new disease? | No. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | I was not here till 1887. |
| 5. Did the first cases attack any special classes of men or houses? | Chinese mostly in the poor class houses. |
| 6. Where was the plague imported from? | ..... |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | ..... |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | Appears every year about end of February to beginning of March. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | For about five months—March-July. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (a.) Increases numbers slightly.
(b.) Wash the drains well out, but it is hard to say if the numbers are lessened. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes, and they vary in numbers according to the severity of the plague. Some years many very mild, other years very few cases. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Some cats were found here by the Japanese Laboratory to contain plague bacilli. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | There has been "pig cholera" here, but whether preceding an outbreak I cannot say. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | That it is spread by personal contact with cases, relatives going from one village to another; but one must also believe in the earth theory from KITASATO's experiments and also rats carrying it from one place to another. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Banka, Twatutia, Kelung, Taihoku, Tamsui and all surrounding villages. |
| 17. Further Remarks :— | The majority of cases take place in very poor, dark Chinese houses with simple mud floors, overcrowded, and generally with dirt of ages all over place, so that if one case occurred, another in the following year was highly probable, and I have been informed by the Japanese Police that if a case of plague occurred one year in a house it generally followed that they had some in the same one for the next two or three years. The Japanese now have all the new houses, by regulations, made with cemented ground floor, and are gradually replacing all the old Chinese underground sewers by open ones with a good fall for flushing out. The late statistics of the Japanese Government of plague cases here cannot be taken as showing an increase over other years, as the reason is that after the beginning of the outbreak last year they made certain notification regulations that led the Chinese to more willingly notify cases than before. |

34.—ENG CHLUEN.

Population: Our Medical District includes about 80,000 persons.

1. Name of Province and Name of Doctor replying. Fukkien. Miss F. P. Crowther.
2. The month and year in which the first outbreak of plague occurred or made its first appearance. Said to be in 1899 in the Spring.
3. Was the plague recognised as a new disease? Yes.
4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances?
5. Did the first cases attack any special classes of men or houses? The houses along the river bank. Supposed to be infected from rats off the Chiu Chew boats.
6. Where was the plague imported from? Chiu Chew, the sea City.
7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? Water traffic by boat from Chiu Chew, for the first cases appeared along the river bank.
8. In what year since the first outbreak and in what month has the plague reappeared? Every year from February to August, a few isolated cases throughout the whole year.
9. Was the plague outbreak preceded by a rat mortality? Always.
10. During what months does the plague prevail? Begins in March, April, May, June, increases in intensity and numbers. July, August, September, gradual decrease in number and virulence in every case save one mentioned under Further Remarks.
11. What influence, if any, has rain on its prevalence?
(a.) Slight rain. (a.) No difference.
(b.) Heavy shower. (b.) Increases it.
12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? Yes, especially in the first years. This year there seems to be a marked decrease in such cases.
13. Do you know of other animals besides rats suffering from plague, if so, what are they? Bats, preceding a bad epidemic here. The bats died by hundreds. The Gickers or house lizards are dying just now, but I have had no opportunity of examining the blood.
14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? Pigs, fowls and buffaloes died last year during the months of May and June.
15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? Rats certainly—but how?
16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. Pe O', 1900, from Eng Chluen, Chiu Tiu Se'u from Chiu Chew Tok Po, 1900, from Eng Chluen all the villages and towns are infected save one, a town called Teh Hoe (noted for immorality and syphilis); though the traffic between Eng Chluen and it is great, I can assign no reason for its immunity, it is only 300 feet higher than Eng Chluen.
17. Further Remarks:— This year the plague commenced in my house (under the following circumstances) and from it was infected a great part of the town of Eng Chluen. In the adjoining house was a room that had been left unopened since the preceding June where I attended 15 persons who died therein. On March 20th this room was opened by a slave, on the 22nd, my rooms, in a native house, which were generally housing with rats and mice now were absolutely free therefrom, food placed on the floor was left untouched, 15 rats were found dead in the stables and adjoining rooms. I noticed that my dog, a collie, eat them with no ill effects. On the 23rd a slave girl in my house was taken ill with high fever and in that day died. The day before her death a

bubo in groin appeared. Meantime the slave girl who had opened the room was stricken and died. Three other persons died in that house later, the 23rd and the 1st of April, whilst three of my household were attacked, of these one who was at once removed to another house, recovered. The first had pain and swellings in groin and then fever, the others who remained in the house and in which the fever preceded the bubo died. I have seen the opposite of this in many cases. My groom went backwards and forwards to his house in a near village, Chiu-tin Sip, he escaped, but his house was the next house infected (without the deaths of any rats as far as I could ascertain), in a week the houses near this house were attacked, rats dying in every case. Meantime the village in which my house was situated was in a deplorable condition, rats dying and dead in the roadway and the people struck down on every side; there were no other cases then in the neighbourhood of Eng Chluen itself, which I attribute to the situation of the house—it was on a narrow part of the ground between the junction of two rivers which shut it off from the main street that led to the City and which is the most densely populated part of Eng Chluen. The plague crossed the river in April—an employee in one of the principal shops was a constant visitor at the house, he took it and died after remaining a day or two in the main street, next an assistant in the shop attached to my house became infected, he insisted on being taken home to his house, in the street there he died, his house seemed to become a centre of infection. The place was densely populated and very filthy, from that place the plague has spread like fire, now the whole neighbourhood in the vicinity of my dwelling has been literally swept by the plague in its most virulent form. This year's epidemic has differed from last year in that (I.) the bubo has invariably been in the groin save in those persons who sucked the buboes of affected persons and then have developed buboes behind the ears. Last year, buboes in neck and axilla were common. (II.) Very few pneumonic forms, last year very common. (III.) In nearly all the death beds I have seen the patients have been more violently delirious than last year. (IV.) The cleanest families have suffered as severely as the overcrowded, filthy ones.

Notes about the house.—It was an ordinary native one, about thirty rooms, all on ground floor, divided between my household and a native family, in all about 27 persons. Kept fairly clean, my part being washed out with creosote every three days. Rats abounded, the rice-beater for the village being on the premises. Rats died and persons were affected with plague in my part of the house as severely as in that part occupied by the native family. The families noted for their cleanliness and wealthy, this year have been attacked as severely as the worst den in the beggars' quarters. Though the house was situated on low-lying ground between two rivers and though it had a fine grove of trees attached, mosquitoes were noticeably fewer than in other parts of the City. I just note the fact, as to me it was inexplicable. I send you these few observations. I fear they are of no use.

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| 1. Name of Province and Name of Doctor replying. | Fukkien. (No Signature.) |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | Summer of 1896 reached Hing Hua. Summer of 1897 O-iün. Not certain about it, but it is near. |
| 3. Was the plague recognised as a new disease? | Recognised by foreigners, and natives called it Rat Plague. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the first cases attack any special classes of men or houses? | Opium smokers died worse. No further destruction known now. |
| 6. Where was the plague imported from? | Said to have come up the coast. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | ..... |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | It has been in Hing Hua and here every year since. Not sure about O-iün. |
| 9. Was the plague outbreak preceded by a rat mortality? | Yes. |
| 10. During what months does the plague prevail? | About May to November. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | (b.) Sometimes seem to abate temporarily. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Yes, few. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Bats, mice, and rabbits are said to have it. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | ..... |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | ..... |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Only south and east of Teli-hoa. |
| 17. Further Remarks :— | I am unable to give you much information because of my having arrived about one year ago and having engaged in practice but little. However there are two Physicians at this place who doubtless will have supplied you with much fuller information. I refer to Dr. J. GROSS and Miss F. PHILLIPS CROWTHER, regretting that I cannot comply more fully with your request. |

36.—SIO KHOE or SIO KEE.

Population : 3,000.

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| 1. Name of Province and Name of Doctor replying. | Fukkien. Dr. C. O. Slumpy. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | There never has been a case at Sio Ke proper. |
| 3. Was the plague recognised as a new disease ? | As plague. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances ? | No. |
| 5. Did the first cases attack any special classes of men or houses ? | No. |
| 6. Where was the plague imported from ? | Chiang Chin to E-Che to Poana. |
| 7. Was it introduced by road traffic or by water traffic or by both ? and by any special class of men such as traders, tailors, etc. ? | Road traffic traders. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared ? | Always present but at present (May) most severe. |
| 9. Was the plague outbreak preceded by a rat mortality ? | Yes. |
| 10. During what months does the plague prevail ? | ..... |
| 11. What influence, if any, has rain on its prevalence ?
(a.) Slight rain.
(b.) Heavy shower. | |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness ? | At first many of them were such. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they ? | No. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak ? | No. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease ? | Filthiness and absolute indifference of Chinese. |
| 16. What villages and towns in your district have been infected ? Please state year and, if possible, the month of the first infection against each. | ..... |
| 17. Further Remarks :— | The disease was first carried from Chiang Chin to E-Che and then from latter place to Poana. |

37.—HOK CHIANG CITY.

Population : 23,000.

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|---|--|
| 1. Name of Province and Name of Doctor replying. | Hok Chiang. Miss M. Poulter. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | I first heard of cases in April, 1902, but the natives tell me there were some in 1901. |
| 3. Was the plague recognised as a new disease ? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances ? | No. |
| 5. Did the first cases attack any special classes of men or houses ? | Not as far as I can ascertain, all classes seem to have been attacked. |
| 6. Where was the plague imported from ? | Cannot ascertain, the natives say it came of itself, was not brought by anyone. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special classes of men such as traders, tailors, etc. ? | ..... |
| 8. In what year since the first outbreak and in what month has the plague re-appeared ? | 1901—April, May, June, July, August, severest in some places in September, October, November. 1902—March, April, May. |
| 9. Was the plague outbreak preceded by a rat mortality ? | In most cases. |
| 10. During what months does the plague prevail ? | Most severe from April to July but there have been a good many cases in the autumn months, some natives say it has never died quite out since its first case. |
| 11. What influence, if any, has rain on its prevalence ?
(a.) Slight rain.
(b.) Heavy shower. | Cases are fewer and lighter during rains. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness ? | Yes. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they ? | Rabbits and chickens have died in some places before and during an attack. At Go-Sang-Che goats died and all who ate it died of plague. In one place I heard of pigs dying. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak ? | In one place I heard of pigs dying before an attack of plague. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease ? | The utter carelessness of the people, crowding in to see the patients, allowing them to travel in sedans with the plague on them, no disinfection, keeping and using clothes, etc., belonging to plague patients. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Hardly any village has been exempt, though some have been visited more severely than others. I cannot give accurately time of first infection in each place, as my knowledge is, to a great extent, based on native information; the natives here do not call in foreign help for this much. |
| 17. Further Remarks :— | |

38.—LIAOYANG.

Population . about 80,000.

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|---|---|
| 1. Name of Province and Name of Doctor replying. | Shing-Jing. Dr. D. D. Muir. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | 1899, about December |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any case previous to the outbreak, if so, when and under what circumstances? | Was not resident here when it appeared. Have never seen a case of plague. |
| 5. Did the first cases attack any special classes of men or houses? | No means of ascertaining. |
| 6. Where was the plague imported from? | Port of Newchwang. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Supposed to be by road. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | None since above date, <i>i.e.</i> , December, 1899. |
| 9. Was the plague outbreak preceded by a rat mortality? | No. |
| 10. During what months does the plague prevail? | See No. 8. |
| 11. What influence, if any, has rain on its prevalence?
(<i>a.</i>) Slight rain.
(<i>b.</i>) Heavy shower. | Was seen in the winter time. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Cannot say. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | Cannot say. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Cannot say. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Have never seen a case. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | No villages affected in this neighbourhood. |
| 17. Further Remarks:— | From above answers to the questions asked, you will see that the plague only made its appearance once—the year when it was had in Newchwang, 1899, only two cases were seen. They were not treated by foreign doctors; both cases were fatal. There is no plague here at present. |

39.—MANILA, PHILIPPINE ISLANDS.

Population : 302,154.

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|---|---|
| 1. Name of Province and Name of Doctor replying. | Manila. Dr. L. M. Maus. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | January, 1900. |
| 3. Was the plague recognised as a new disease? | Yes. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | No. |
| 5. Did the cases attack any special classes of men or houses? | Chinese. |
| 6. Where was the plague imported from? | Hongkong. |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | Water traffic. Class of men unknown. |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | See attached Table of Cases. |
| 9. Was the plague outbreak preceded by a rat mortality? | Unknown. |
| 10. During what months does the plague prevail? | February, March, April, and May seem to be the months during which plague is most prevalent. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | The height of the dry season is the climax of plague. The number of cases lessens rapidly after the heavy rains begin. |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | A few. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | All rodents. |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | Rinderpest. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | Rodents introduce the disease, which spreads by direct contagion or inoculation. Experiments conducted here fail to connect the mosquito with the dissemination of the disease. |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | Two cases reported from Cebu this year (1902). |
| 17. Further Remarks :— | See enclosed extract as below. |

PLAGUE RATS, AND METHODS EMPLOYED FOR THEIR DESTRUCTION.

Two cases of plague occurred during the month, both of which proved fatal. The first case, a Filipino woman living on Calle Victoria, Intramuros, was discovered a few moments before death and was unattended by a physician. The second case, that of a Chinese living on Carvajal Street, and also unattended by a physician, was reported by a Sanitary Inspector, the diagnosis verified, and the man at once removed to the Pest Hospital, where he died the following day. Forty-eight cases of bubonic plague occurred in February, 1900, and twenty-seven during the same month of 1901. In view of the association between plague and rodents, an incessant war has been waged against the latter since September, 1901, by the Board of Health. Squads of rat-catchers, armed with traps, rat-bane, and other necessary implements, have been assigned to the various districts of the City, under the supervision of the district Sanitary Inspector. These squads generally consist of ten rat-catchers with a chief, who becomes responsible for the placing of traps, bane, and the collection of rats. During February, twenty thousand and one rats were actually delivered to the Government Laboratory, 9,834 of which were examined microscopically for plague infection, and thirteen found affected. Since September last, 53,773 have been secured by the Board of Health, either through the official rat-catchers or natives, 40,666 of which have been examined microscopically for bacilli. Of the number examined, 242 have been found affected with the plague. Percentage of plague rats for November, 1.14; for December, 1.33; for January, $\frac{3}{100}$ of 1%; for February, $\frac{1}{100}$ of 1%. It will be noted that since December the percentage of plague rats has rapidly decreased. During November and December, on certain days plague rats amounted to three or four per cent. of those delivered. During February the aggregate of traps set amounted to 65,379, and rat-bane placed to 403,789 plates. The streets of each district are visited in order, and traps and bane placed for three days and nights consecutively in each house. The following methods are employed for catching or destroying rats: (1.) Traps baited with bacon, fish, cheese, meat scraps, or boiled rice. (2.) By hand. In this case the rat-catchers run the arm into holes, rat-runs, sewers, or catch them after being driven out of old lumber piles, or from under shacks which are being removed, etc. In some instances rat-catchers have been badly bitten, but except a slight phlegmonous inflammation, no serious results have arisen. (3.) By means of nets placed over holes or sewers from which the rats have been driven by hot water, carbolic solutions, or the fumes of sulphur. (4.) By the use of poisoned foods. The following articles have been used with more or less success: (1) prepared rat cheese; (2) rat paint; (3) a mixture of ground glass, flour, corn meal, syrup, with a 1 per cent. of strychnia; (4) ground rusty bacon with 60 per cent. of arsenious acid; (5) boiled rice with 60 per cent. of arsenious acid; (6) a dish of flour and plaster of Paris, equal parts, with a dish of water on the side. Death from the last method is produced mechanically. Boiled rice is quite popular with rats, but the best results are obtained through the rusty bacon preparation. The number of rats destroyed by bane is not known, but it is believed that several hundred thousand have been destroyed in this way.

Shiga Anti-Pestic Vaccinations.—A systematic effort has been made to immunize the susceptibles of Manila against bubonic plague by means of the Shiga anti-pestic vaccine. The work was begun on the 15th of January, and so far 7,440 persons have received the primary inoculation, and 1,335 both primary and secondary. Until quite recently the vaccine was produced at the Government Laboratory, from 200 to 300 doses furnished daily. In beginning this work, the Board of Health believed that it would be necessary to immunize from 75,000 to 100,000 of the inhabitants, and especially those living in Intramuros, Binondo, San Nicolas, Tondo, Quiapo, and Santa Cruz, the pest districts. The lower classes, which include the Chinese, cocheros, labourers, servants, peddlers, etc., with their wives and children, occupants of the lower floors and nipa houses, were particularly intended to receive this attention.

Dr. J. V. TORMEY, Medical Inspector of the Board, was placed in charge of this work, and, so far, has carried it on effectively and without opposition from the people. At the request of the representative Chinese of the City, the services of Miss SEAGRAN were secured to vaccinate the wives and children of the Chinese population. On January 22nd, arrangements were made by cable with Prof. KITASATO, of Tokio, to ship 10,000 doses of Shiga anti-pestic vaccine weekly, and the first invoice arrived March 2nd. At present seven additional native physicians are employed to assist the Board in these inoculations.

NUMBER OF PLAGUE CASES DURING THE YEAR 1900 IN THE CITY OF MANILA.

MONTHS.	CASES.				DEATHS.			
	Chinese.	Filippino.	American.	Total.	Chinese.	Filippino.	American.	Total.
January ...	3	15	0	18	2	9	0	11
February...	36	12	0	48	24	11	0	35
March ...	52	12	0	64	38	10	0	48
April ...	43	11	0	54	36	8	0	44
May ...	13	7	2	22	11	6	1	18
June ...	14	5	0	19	6	5	0	11
July ...	5	8	0	13	4	3	0	7
August ...	8	9	1	18	5	6	0	11
September...	6	0	0	6	8	1	0	9
October ...	5	2	0	7	3	2	0	5
November ...	1	0	0	1	0	0	0	0
December ...	0	1	0	1	0	0	0	0
	186	82	3	271	137	61	1	199

NUMBER OF PLAGUE CASES DURING THE YEAR 1901 IN THE CITY OF MANILA.

MONTHS.	CASES.				DEATHS.			
	Chinese.	Filippino.	Spanish.	Total.	Chinese.	Filippino.	Spanish.	Total.
January ...	4	3	0	7	2	3	0	5
February...	15	11	1	27	11	8	1	20
March ...	49	14	0	63	40	11	0	51
April ...	73	38	0	111	60	31	0	91
May ...	97	40	0	137	89	35	0	124
June ...	24	30	1	55	28	25	1	54
July ...	18	21	0	39	19	18	1	38
August ...	9	25	0	34	9	16	1	26
September...	4	4	0	8	7	5	0	12
October ...	4	4	0	8	3	4	0	7
November ...	0	0	0	0	0	0	0	0
December ...	1	3	0	4	3	0	0	3
	298	193	2	493	271	156	4	431

(One American reported.)

NUMBER OF PLAGUE CASES DURING THE YEAR 1902 IN THE CITY OF MANILA.

MONTHS.	CASES.				DEATHS.			
	Chinese.	Filippino.	Spanish.	Total.	Chinese.	Filippino.	Spanish.	Total.
January ...	0	0	0	0	0	0	0	0
February...	0	1	0	1	0	1	0	1
March ...	0	2	0	2	0	1	0	1
April ...	0	0	0	0	0	0	0	0
May ...	0	0	0	0	0	0	0	0
	0	3	0	3	0	2	0	2

40.—WEIHSIEN.

Population : 70,000 to 75,000.

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| 1. Name of Province and Name of Doctor replying. | Shantung. Dr. W. R. Faries. |
| 2. The month and year in which the first outbreak of plague occurred or made its first appearance. | No epidemic, a few sporadic cases in July of two different years—in 1896-1897. I am writing from memory. |
| 3. Was the plague recognised as a new disease? | No. It is known to the native doctors as " <i>hei tsu</i> " black abscess. |
| 4. Had you met with any cases previous to the outbreak, if so, when and under what circumstances? | ..... |
| 5. Did the first cases attack any special classes of men or houses? | One family of renderers of dead animals had it, and three or four had it and died, but it did not spread. |
| 6. Where was the plague imported from? | ..... |
| 7. Was it introduced by road traffic or by water traffic or by both? and by any special class of men such as traders, tailors, etc.? | ..... |
| 8. In what year since the first outbreak and in what month has the plague re-appeared? | ..... |
| 9. Was the plague outbreak preceded by a rat mortality? | No evidence obtained. |
| 10. During what months does the plague prevail? | These few cases have been seen in June and July, in dry weather, I believe. |
| 11. What influence, if any, has rain on its prevalence?
(a.) Slight rain.
(b.) Heavy shower. | |
| 12. Are there mild cases of plague among the Chinese in which the patient suffers little and works about with a bubo during his illness? | Have seen none. One case was living with the whole skin of groin, buttock, and back dissected free from the body. |
| 13. Do you know of other animals besides rats suffering from plague, if so, what are they? | ..... |
| 14. Has there been any illness prevalent among pigs or cattle preceding the plague outbreak? | The family mentioned above had rendered a dead donkey and they laid it to that. |
| 15. What opinion have you formed from your own observation as to the main cause or causes of the spread of the disease? | ..... |
| 16. What villages and towns in your district have been infected? Please state year and, if possible, the month of the first infection against each. | ..... |
| 17. Further Remarks:— | The cases seemed to be clearly bubonic plague, some were infections of the glands of the neck, but these did not seem to be Angina Ludovici. We see poisonings from dead meat and the like that puzzle one without a laboratory to appeal to, but these are not considered here. |

41.—SZEMAO.

Population: 8,000.

1. Name of Province and Name of Doctor replying.

Yunnan. **Dr. Santon**, Agent Consulaire de France à Szémao. Médecin aide major de 1^{ère} classe des Troupes coloniales.

Pour tous les renseignements que vous désirez les meilleures sources sont les rapports médicaux des douanes impériales chinoises publiés en librairie et le Tome II de l'ouvrage de M. EMILE ROCHER, intitulé "La Province du Yunnan" et où sont notées toutes les épidémies de peste survenues au Yunnan avec la carte de la marche de l'infection à chaque recrudescence.

Je n'ai observé aucun cas de peste depuis bientôt deux ans que je suis dans ce port.

42.—PEKING.

Population: 1,000,000.

1. Name of Province and Name of Doctor replying.

Chili. **Dr. G. D. Lowry.**

Has never been known here so far as I am able to ascertain.

43.—SZECHUAN.

1. Name of Province and Name of Doctor replying.

Chentu. **Dr. O. W. Kilborn.**

There has been no plague in this Province for the past ten years—cannot say what may have been before.

44.—HANKOW.

Population: 500,000 to 1,000,000.

1. Name of Province and Name of Doctor replying.

Hu-peh. **Dr. Th. Spruijt.**

No cases of plague within the last thirteen years Previous to that I do not know.



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REPORT ON THE QUESTION OF THE HOUSING OF THE POPULATION OF HONGKONG.

HONGKONG, *May 14th*, 1902.

SIR,

We have the honour to submit for the information of His Excellency a conjoint Report on the question of the housing of the population of Hongkong, and in compliance with the request of His Excellency in Council to prepare a Bill which might reasonably be expected to obviate the necessity for further Sanitary legislation, for the next few years at least, we append a draft Bill on the lines indicated.

1. The insanitary areas in Hongkong have been formed, first, by the crowding together of too many houses on too small a space; secondly, by sanitary defects in the design of dwelling houses; and thirdly, by overcrowding of the inhabitants in these houses.

CROWDING TOGETHER OF TOO MANY HOUSES ON TOO SMALL A SPACE.

2. The crowding together of too many houses on too small a space has been effected by the construction of narrow streets and lanes and by the omission to provide adequate open space in the rear of houses in the shape of back-yards and of back-lanes. The houses have thus been brought into close proximity to one another instead of being well separated with ample space between them. The conditions vary in intensity according to the age of the built over areas. The worst conditions are to be found where back to back houses have been constructed or where the lane between the rear of houses is not more than 6 or 8 feet wide. In either case neither light nor ventilation is accessible from the back, while only a very inadequate amount is obtainable from the narrow street or lane in front owing to the height of the houses being out of all proportion to the width of the street or lane. Similar unhealthy conditions occur when the rear of the house abuts on the hill-side with the additional circumstance that the house is rendered damp during the rains from percolation of water from the hill.

The best conditions are to be seen in the newest localities, more especially in Kowloon where the houses are separated from one another by wider streets and where back-yards or back-lanes and in some cases back-yards and back-lanes are provided, but even here, though a great improvement on the old areas has been effected and, in that respect, the conditions are more healthy, yet as will be shown later the separation is not to such an extent as to prevent the areas when completely built over becoming more or less insanitary and bearing a resemblance in a minor degree to the insanitary areas of the older period. Between the old and the new localities there is every variety of density, and as the density of the houses approximates more to the one or to the other, so do the insanitary conditions vary. Houses like individuals require a certain amount of space to themselves to be healthy, and

To the Honourable

THE COLONIAL SECRETARY.

if that space is encroached upon in any way and the houses are brought in close proximity to one another without compensating arrangements for adequate ventilation and exposure of the rooms to sunlight, it is only a matter of time for the locality to become unhealthy.

3. The necessary amount of separation of houses where property is valuable and where a large population is to be housed is usually secured by regularly laid out streets which bear a proportion in their width to the height of the houses facing them and by a definite proportion of back-yard and back-lane in the rear which also bear in their width a relationship to the height of the house as well as to its roofed over area.

The importance of the width of the street is readily appreciated because it facilitates traffic and for that reason there is of recent years no difficulty as a rule in obtaining ample separation of houses facing a street, but the importance of the space behind houses and the necessity for a similar amount of space as exists in the street before another house is permitted to be built in the rear, is not so manifest and consequently there is always a tendency on the part of property owners to curtail this space; the greater their success in curtailment the more unhealthy does the locality become. Wide streets in front of houses, without wide spaces behind to separate them from the houses in the rear, do not provide sufficient air space to secure a healthy locality.

Crowding together of Houses under old Regulations.

4. The crowding together of houses on too small a space is well exemplified in Plate I, which represents an area, bounded by Hollywood Road, Queen's Road Central, Wellington Street and Aberdeen Street. The area of the block is 171,224 square feet, equal to 3.93 acres. It contains 142 houses comprising 470 floors. The area of streets upon which buildings front within this block is 19,890 square feet equal to 0.45 acres. The area of the back-yards and other open spaces around the buildings is 5,516 square feet, equal to 0.13 acre. Thus no less than 85 per cent. of the total area is roofed over, and if the open space of the streets and lanes be excluded, that around buildings only amounts to 3.2 per cent. It is obvious that the crowding together of houses in this block, could hardly be greater, and resumption for the purpose of opening out wider streets and improving the sanitary condition of the houses is urgently needed.

Plate II gives a sectional view of another block, which is bounded by Hollywood Road, Cochrane Street, Lyndhurst Terrace and Pottinger Street. From the streets, which are moderately wide, the block has an excellent external appearance and is likely to give an erroneous impression of the interior which on inspection is found to be packed with houses, separated by narrow lanes. This Plate further illustrates the arrangement of basements which is so common throughout the City.

Plate III is another illustration of buildings being erected too close to one another. On a piece of land of 86 feet in depth two rows of houses have been built separated by a lane of 8 feet. The front houses face Queen's Road, and are four storeys in height. The houses in the rear, are also four storeys high, the two lower of which abut on the side of the hill and are below the level of the street known as Circular Pathway, while the two higher face, and are entered from, Circular Pathway. It is evident that each house obstructs the light and ventilation of the other and that the two lower stories of the houses at the back of the Queen's Road houses are practically basements.

It is seen from the plan that the space behind the Queen's Road houses is only 8 feet in the form of a lane. This 8 feet space gives, when a line is drawn from the building line of the houses in the rear at the level of the lane, to the back eaves of the Queen's Road houses, an angle of 82° , or the height of the houses is nearly 7 times that of the open space in the rear instead of being either equal to, or $1\frac{1}{2}$ times, or certainly not more than twice.

The usual angles taken for the rear, measured in the same way from the building line to the eaves of the opposite building vary between 45° and 63°, a fair standard being 56°. From the lines drawn on the plan, representing these angles, it is apparent there is no space for another house between the hill side and the rear of the four-storied houses in Queen's Road and the close proximity of the two rows of houses to one another renders both insanitary.

5. The preceding Plates deal with closely packed areas which have existed for many years and which have grown up either under old regulations or when there were none. They are typical of the general condition of such areas in different parts of the town. The following three Plates deal, not with the past but with the present; they represent areas on which buildings are now being erected and which are springing up under existing regulations. They show that existing regulations do not prevent crowding together of houses.

Crowding together of Houses under existing Regulations.

6. Plate IV. Inland Lot 799 is bounded on the north by Third Street which is 30' 6" wide, on the south by Pokfulum Road which is 32' 0" wide, on the west by Water Street which is 28' 8" wide, and on the east by Pokfulum Road which is 31' 0" wide. The lot consists of two blocks, containing 37 houses of which 21 are old, and 16 are new. The houses are 40 feet in height. The blocks are divided by a 16' 0" private lane which is the frontage of 10 houses in the south blocks and which also forms the open space required by section 56 of Ordinance 13 of 1901² for the rear of the houses in the north block.

By this section of the Ordinance ten square feet for each foot of width is required at the rear of the houses facing Third Street as they are over 40 feet deep and less than 50 feet. The inclusion of the lane which is really the frontage of the houses on the south side in the calculation of open space for the rear of the houses in Third Street is unsatisfactory enough, but there appears to be nothing in the Ordinance when the houses in Third Street are re-built to prevent the private lane in the rear being encroached on, and the houses being thus brought nearer to one another, or to prevent the owner, should he make Pokfulum Road the frontage and entrance into the houses to contract the private lane, which is no longer a lane on which houses front, to 8 or 11 feet wide which would act as the open space in rear of such buildings and would conform with the existing provisions of the law.

7. Plate V, which shows the section of one of the houses in the south block, makes it appear that there is between the lower floor of the house and the hill-side a moderately sized open area, throughout its entire width, but a reference to the

* 56.—(a.) Every domestic building hereafter erected in this Colony, (except in cases provided for by section 54 of this Ordinance, or coming within the terms of Articles of Agreement under the Praya Reclamation Ordinance, 1889) shall be provided by the owner with an open space in the rear in accordance with the following scale:—

Houses not exceeding 40 feet in depth, for each foot of width.....	8 square feet.
Houses exceeding 40 feet but not exceeding 50 feet in depth, for each foot of width.....	10 square feet.
Houses exceeding 50 feet but not exceeding 60 feet in depth, for each foot of width.....	12 square feet.
Houses exceeding 60 feet in depth, for each foot of width.....	14 square feet.

(b.) In no case may any obstructions whatever be placed or erected in these open spaces, with the exception of a bridge or covered way on each storey when such bridge is necessary as a means of access to any part of the domestic building: such bridge shall not exceed three feet six inches in width unless the building exceeds twenty-five feet in width, in which case the bridge may be of a width not exceeding five feet. The building must also be provided on every floor with a window of at least ten square feet superficial area opening into such open space and the area of such window shall not be included in calculating the window area required by section 69 of this Ordinance.

(c.) Provided always that when the owners of a block of buildings agree to make and do make a lane opening at both ends upon a public thoroughfare and free from obstruction throughout both vertically and horizontally, the foregoing requirements shall be modified as follows:—

Houses not exceeding 40 feet in depth: a lane not less than.....	6 feet wide.
Houses exceeding 40 feet but not exceeding 50 feet in depth: a lane not less than.....	8 feet wide.
Houses exceeding 50 feet but not exceeding 60 feet in depth: a lane not less than.....	11 feet wide.
Houses exceeding 60 feet in depth: a lane not less than.....	13 feet wide.

(d.) The buildings must be provided on every floor with a window of at least ten square feet superficial area opening into such open space. The area of such window shall not be included in calculating the window area required by section 69 of this Ordinance.

(e.) In computing the depth of a domestic building for the purposes of this section the depth of the kitchen shall be included in the computation of such depth in every case except when such kitchen is separated from the principal room or rooms of such building by an open backyard of at least six feet in depth extending the entire width of the back of such building and unobstructed except by a bridge on each floor not exceeding the width specified in sub-section (b.)

ground plan shows that this is not the case. The houses are built in echelon fashion and thus one corner of the building is practically against the toe of the hill-side the open space being triangular in shape.

The total area of Inland Lot 799 covers 29,414 square feet. The area built over is 23,620 square feet. The area of private lane is 4,480 square feet. The area of open yard is 1,314 square feet. The total area of open space is 5,794 square feet, which is 19 per cent. of the total area, accordingly in this building lot a little over 80 per cent. of the ground is covered with buildings and if the area of the private lane be excluded not more than $4\frac{1}{2}$ per cent. of the built over area is devoted to open yards.

8. Inland Lot 816, which is also shown on Plate IV, is bounded on the north by Second Street which is 36' 0" wide, on the south by Third Street which is 30' 6" wide, on the west by Water Street which is 54' 0" wide, and on the east by vacant land the average width of which is 19' 0" and which is in separate ownership and may be built on. It consists of five blocks containing 38 houses, 40 feet in height, of which 24 are new and 14 are old. The 14 old houses face Second Street and comprise one block, 16 of the new houses face Third Street and comprise the second block, while the 8 other new houses have been erected in the intervening space between the row of houses in Second and Third Streets, and comprise the third, fourth and fifth blocks, separated laterally from each of the other blocks by 2 lanes which are respectively 6 feet and 9 feet wide.

The first and second blocks possessed each a space at their rear, before the building of the other blocks of sufficient size to secure an adequate amount of light and ventilation, but the erection of the blocks between them, has altered the character of the lot area, formed two objectionable narrow lanes in addition to two wider private lanes and has materially obstructed the light and circulation of air in the blocks. The building lot as regards crowding of houses upon it is very little superior to or different from older lots. The only difference is that inside the lot six of the houses have small backyards, in compliance with section 56 of Ordinance 13 of 1901. There are also two cross private lanes in order to comply with the regulations as to height of buildings in relation to width of streets, the height of these houses being governed by Ordinance 15 of 1894 as the plans were submitted in 1900, before Ordinance 30 of 1901, restricting the height of houses to $1\frac{1}{2}$ times the width of the street, was passed. The same arrangement in regard to the crowding together of the houses, however, could have been made even under the Ordinance of 1901. There is moreover nothing in the Ordinance governing the height of houses to prevent the width of the street being taken as a part of the open space required by section 56. In this connection one of the private lanes which is the frontage of two of the interior houses and the width of which governs the height of the houses is also calculated as the open space required by section 56 to be provided in the rear of the houses fronting Water Street.

The total area of the Inland Lot 816 is	30,826	square feet
The area built over is	25,656	"
The area of private lanes is	3,480	"
The area of streets is	1,200	"
The area of yards is	490	"
The total area of open space is	5,170	"

accordingly 83 per cent. of the total area is built over; and if the private lanes and streets be deducted less than 2 per cent. is devoted to back-yard.

9. Plate VI is Inland Lot 797 which shows buildings that conform to the Ordinances in regard to back-yards and open spaces in the rear. It consists entirely of new houses of which there are 36, but it is only another example on a small scale

of the insanitary areas that can be constructed, even when all the houses are new, under the existing regulations, with narrow streets and lanes, and too many houses crowded together.

The lot is bounded on the north by Third Street 30' 6" wide, on the south by a retaining wall to about the level of the second floor and above that by Pokfulam Road 32' 0" wide, on the west by buildings, and on the east by a private street 15' 0" wide.

The total area of the lot is	36,000	square feet.
The area built over is about.....	25,849	" "
Area of private streets is	6,600	" "
Area of passages which also includes space in the rear of houses required by section 56 of Ordinance 13 of 1901	2,531	" "
The area of open yard	1,020	" "

The total area of open space is equal to 10,151 or 28 $\frac{1}{2}$ % of the total area, and the yard space excluding lanes is less than 3 $\frac{1}{2}$ %.

SANITARY DEFECTS IN THE DESIGN OF CHINESE HOUSES.

10. The defects in design of houses which contribute to their unhealthiness, are caused by their great depth without lateral windows, the position of the kitchen in relation to the dwelling house, the position of the back-lane in relation to the kitchen and the dwelling house, the construction of rooms or basements against or too close to the side of the hill and the division of rooms into cubicles. All of them serve to obstruct the light and free circulation of air so necessary for a healthy dwelling.

Besides the close, narrow and ill ventilated streets and lanes, formed by the process of erecting too many houses on too small a space, the structure of the houses and of their interior, is not in accordance with sanitary principles. The newer houses are often worse in this respect than the older, for at one time the tendency was to build shallow houses from which sunlight and fresh air were excluded in consequence of other houses being built later in too close proximity to them. As time has gone on the houses have generally become deeper and deeper, until there are being erected on the Praya Reclamation back to back buildings of from 75 to 90 feet each in depth with an extra 10 feet of verandah in each encroaching on the public street.

11. Plates VII and VIII are sections of houses on the Praya Reclamation. In both the buildings are 75 and 90 feet respectively without counting verandahs or balconies. The dwelling rooms in Plate VII are 55 feet long and 12 feet 6 inches wide, in Plate VIII they are 90 feet long and 13 feet wide. There are no lateral windows.

In Plate VII there are windows in front opening into the verandahs and windows behind opening into a small back-yard, 12 feet in width which is the amount of open space required by the Praya Reclamation Ordinance. Behind the back-yard is the kitchen which, owing to there being a kitchen for each floor, forms a building as high as the house, immediately in the rear of the small back-yard, the means of communication between each storey of the house and the kitchen being by a bridge 3 feet 6 inches wide. The design, it will be seen, is admirably adapted to exclude sunlight and fresh air. There is first of all the long narrow tunnel-like rooms, without lateral windows, which prevent a sufficiency of light reaching, during any part of the day, the greater portion of the room. There is next the small back-yard obstructed by the bridges leading to the kitchens, there is then the high building containing the kitchens abutting immediately on the back-yard, and forming with it a deep well, which only brings light and air to the upper storeys, and finally there is the verandah

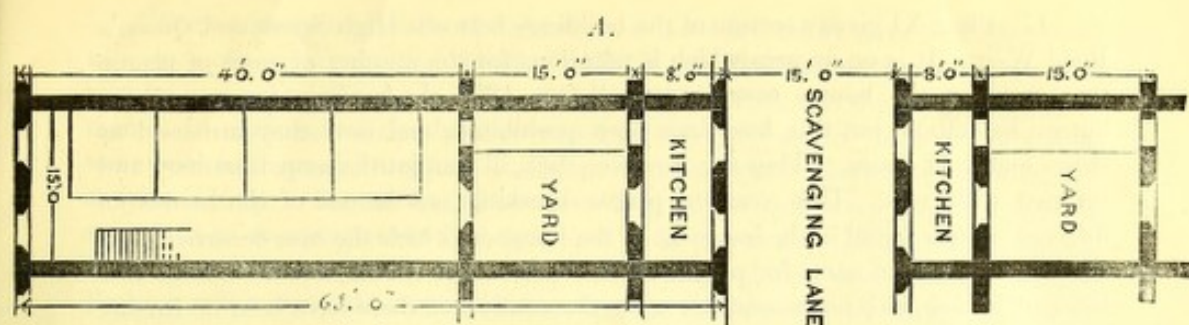
in front. With a design such as this the rooms on the lower storeys are dark, and oppressively hot and close owing to obstruction of light and stagnation of the air.

12. On a further examination of Plate VII it will be seen that notwithstanding the provision of a back-yard to each house, the design practically leads to the formation of back to back buildings and when analysed resolves itself into 3 blocks of buildings, two of which are the dwelling houses and the third the kitchens forming the middle block, which is separated from the others by narrow spaces called back-yards. The benefits intended to be derived from the back-yard are counteracted by the high building in the centre. With this obstruction removed a far greater amount of light and air would have been admitted into the different rooms, for the block of kitchens which form the obstruction occupy a space of 21 feet 6 inches in depth which, added to the two back-yards, would have made a combined open space in the rear of 42 feet in width which is a greater amount of space than is required by an angle of 56° and a good deal more space than that required by an angle of 63° . The houses on both sides are rendered insanitary by the three extra storeys of kitchen building.

If a kitchen or outhouses had been only required on the ground floor, which is usually the case with European houses in this Colony, and which at the most, are only 12 or 15 feet in height, the design of the kitchen building behind the back-yard and against that of the house in the rear would not have been objectionable except for the absence of a scavenging lane between them, because, out-buildings of the height mentioned would not have obstructed the light and air of the lower storeys of the dwelling houses when the main buildings above that height were separated from one another by a space of over 40 feet. The usual arrangement in Europe to facilitate scavenging, is to have behind the out-buildings an additional small back-lane and such a lane is especially necessary in tropical towns.

This back-lane has been in some instances adopted in Hongkong but, as the kitchens on each storey form a building sometimes of a height of nearly 60 feet, the back-lane does not serve to increase the area of open space available for light and ventilation between the backs of the houses, as is the case when it is between out-buildings of only 12 or 15 feet in height, but it only adds a fresh place for the deposit of filth. The back-lane, behind high kitchens even when the latter have windows facing the lane, which is often not the case, can at the best only affect the kitchens and not the dwelling rooms of the house while for scavenging purposes a lane of this kind is ineffectual because for it to be used as such everything would have to be thrown from the windows which is not a desirable practice to encourage. Seeing that in tenement houses, which practically means over 90 per cent. of Chinese houses, there must be a kitchen on each storey for the use of the occupants it is necessary to adopt some other position for the kitchen than that in the rear of the back-yard and this position must be such as not to obstruct the light of the dwelling room, while securing in the rear of the houses, by means of combined back-yards and a scavenging lane, a sufficient distance between opposite buildings to prevent the crowding together of buildings, and to secure an adequate amount of space for light and ventilation of the dwelling rooms.

Back-lanes situated behind kitchen buildings in the rear of back-yards do not light and ventilate the dwelling house. There are houses now being constructed in the Colony which are not only provided with back-yards but also with 15 feet back-lanes, yet because of the position of the kitchen, the back-lane is rendered useless for the purpose of bringing light and a free circulation of air to the dwelling house, as the supply of light and air obtainable from the back-lane is obstructed by the high building containing the kitchens and never reaches the dwelling rooms of the house for which it was intended. The fact is both back-yard and back-lane are rendered ineffective because of defects in the arrangement and design of the house. This is exemplified in accompanying sketch A where the kitchen building is between the back-yard and back-lane.



Scale 1 inch = 16 feet.

It will be seen that a fair amount of ground is given over to provide open spaces. The width of the two back-yards and the back-lane making a width of 45 feet, all of which is practically wasted by being broken up into three separate open areas by two rows of high buildings used as kitchens instead of being combined and thus forming one open space of 45 feet between the dwelling houses. The amount of space actually given up is equal to $\frac{1}{3}$ of the roofed over area together with a scavenging lane of 6 feet in width.

13. Plate VIII illustrates the necessity for limiting the depth of a dwelling house which is not furnished with lateral windows; the dwelling rooms shown are 90 feet in depth by only 13 feet in width, the open space in the rear of this tunnel being practically valueless for the lighting and ventilation of the dwelling rooms. In the Bill provision has been made that no building shall exceed forty feet in depth without lateral windows.

14. Plate IX shows the requirements as to rear space of a Chinese house of an ordinary height of 50 feet with a back-lane of 6 feet in width, for scavenging purposes.

15. Plate X, which represents a type of house recently built in one part of Hunghom, indicates the direction in which improvements have already been made on the lines indicated.

The kitchen is attached to and forms part of the house. It extends to about half the width of the rear wall of the house which permits a window to be placed in the other half, which looks out into the open yard in the rear. Behind the kitchen is a smaller building which is a latrine for the ground floor. The yard in the rear is enclosed by a wall of about 8 feet in height with a door into a scavenging lane of 15 feet in width. It is not necessary to have scavenging lanes of this width, 6 to 8 feet would meet the requirements of the case, and the remaining space could be enclosed by a low wall and would serve to increase the area of the yard behind the house.

Basements and Buildings abutting on Hill-side.

16. In Hongkong the tiers of streets which run from east to west and which have been cut out of the hill-side favour the building of houses which on one side of the street have their rear brought close to the side of the hill and which on the opposite side have the lowermost storey below the level of the street thus forming a basement. If the plots of land abutting on the street are of considerable width two rows of houses are built with a narrow intervening lane between the rows. It is very seldom that an adequate amount of space is provided between the rear of the house and the hill-side, or a good sized area between the street and the basement. As a rule the rear of the house is brought close to or forms part of the hill-side and the basement has for one of its sides the retaining wall of the street or is built up in close juxtaposition to it, with a small area of a few feet encroaching on the street pathway and covered by a grating which is intended to give light and ventilation to the basement. If a building is in rear of the basement, which is frequently the case, the entrance of light and air is still further excluded from the basement.

17. Plate XI gives a section of the buildings between High Street and Queen's Road West. It is on an area which is notorious for the number of cases of plague that occur in the houses every year. Before 1894 the basements were used for human habitation, but this has since been prohibited, and now they are used as stores and work-shops. They are, however, dark, ill ventilated, damp, insanitary and infested with rats. This year on plague breaking out in one of the houses an infected rat was found in the basement of the house in which the case occurred. As the block had a bad name for plague it was vacated and the inhabitants housed in a block of houses with no basements, with the result that there have been no further cases among the persons removed.

Houses containing basements of the kind described are always unhealthy, and more or less infested with rats, and are never dry during the rains.

Basements are also to be found in houses fronting streets which run down the hill-side. Whenever practicable these should be filled up.

In future houses, all basements should be abolished. There are many houses built without them so that there is nothing impracticable in demanding, in all new houses, the abolition of the basement.

If basements are to be allowed at all, which should be quite exceptional, they should be at least 8 feet away from the retaining wall of the street. The house being thus provided with an area in front of the basement can be entered by a properly constructed arched step-way. It is important that the basement thus formed shall have a wide back-lane or yard behind it.

Cubicles.

18. A Chinese tenement house is usually three or four storeys in height. Each storey consists of one long room with a kitchen attached. It is not a floor in the European sense of the term, which often consists of half a dozen separate rooms. It is important to remember that a floor as referring to a Chinese tenement house, means a single room. It has been previously stated that this room is long and narrow extending from the front of the house to the back without lateral windows, and on account of its great depth is as a rule deficient in fresh air and exposure to sunlight. In order to make this room serviceable for more than one family, it is partitioned off into small cabins or cubicles. The partitions of the 4 or 6 cubicles into which the room is divided are by section 70 of Ordinance No. 13 of 1901,* not permitted to be higher than 6 feet.

* 70. The following requirements shall be observed with regard to cubicles and partitions:—

- (a.) In domestic buildings fronting streets of a width of less than fifteen feet, no cubicles or partitions shall be erected, or if already existing shall be allowed to remain, except on the top floor.
- (b.) In domestic buildings fronting streets of a width of fifteen feet or over, no cubicles or partitions other than [風屏] "ping fung" (i.e., shop divisions) shall be erected, or if already existing shall be allowed to remain, on the ground floor, and in the case of every such "ping fung" there must be a space between the top thereof and the ceiling or under side of the joists of the room of not less than four feet, which may be closed in only by wire netting, lattice work or carved woodwork, arranged in such a way as to leave at least two-thirds open and as far as practicable evenly distributed.
- (c.) No cubicles or partitions shall be erected, or if already existing shall be allowed to remain, in any kitchen.
- (d.) Where one cubicle only is hereafter erected or already exists in any room of a domestic building, no portion of the structure of such cubicle shall exceed eight feet in height; where two cubicles only are so erected or exist, no portion of the structure of either of such cubicles shall exceed seven feet in height; where more than two cubicles are so erected or exist, no portion of the structure of any such cubicles shall exceed six feet in height. In all cases, however, there must be a space between the top of every portion of the structure of such cubicles and the ceiling or under side of the joists of the room of not less than four feet, which may be closed only by wire netting, lattice work or carved woodwork, arranged in such a way as to leave at least two-thirds open, and as far as practicable evenly distributed.
- (e.) No cubicles whatever shall be erected in any room of a domestic building, or if already existing shall be allowed to remain, unless such room is provided with a window or windows opening directly into the external air and having a total area clear of the window frames of at least one-tenth of the floor area.
- (f.) No portion of the structure of any cubicle except the necessary corner posts shall be nearer than two inches to the floor of such cubicle, and no structure shall be erected, or if already existing shall be allowed to remain, within any cubicle, which is of a greater height than the maximum height allowed by this section for any portion of the structure of such cubicle or which provides a cover or roof to the cubicle.
- (g.) No partition shall be erected, or if already existing shall be allowed to remain, nearer than four feet to any window the area of which is included in calculating the window area specified in sub-section (e).
- (h.) No cubicle used for sleeping purposes shall have a less floor area than sixty-four square feet, and a less length or width than seven feet.

* For the purposes of this section every sub-division of a domestic building, unless such sub-division has a window or windows opening directly into the external air and having a total area clear of the window frames equal to one-tenth of the floor area of such sub-division, shall be deemed to be a cubicle.

When a long and already ill lighted room is subdivided by three or four or even as many as five or six cubicles, the effect is that in only the cubicle next to the window is there any light or fresh air. The others are quite dark and the air is stagnant in them. In addition to the families which occupy the cubicles there are, as a rule, some beds in the remaining portion of the room on which the tenant and family or friends sleep. The amount of overcrowding which this arrangement causes is sometimes to encourage over 20 people to sleep in one room. None of the cubicles, except the front and back, have any windows except in the case of corner houses. Nothing will remedy this state of things but the abolition for all future houses of cubicles unless they have a window to each and the limitation of cubicles in existing houses to top floors, where skylights and special arrangements for ventilation can be introduced and perhaps to corner houses which have lateral windows opening into side streets of not less than twenty feet in width.

19. Plate XII illustrates the arrangement of cubicles in houses in Aberdeen Street and Square Street.

Verandahs.

20. The large masonry verandahs three and four storeys high encroaching on the public streets to the extent of 10 feet on each side lessen the width of the streets and at the same time darken the rooms of the houses, especially of the two lower floors. In all new streets, verandahs encroaching on the public way should not be allowed. Many houses have not these masonry verandahs, but have small balconies of a lighter structure on their own land.

Plate XIII shows a row of houses in the same street with balconies on their own land and another row with masonry verandahs encroaching on the public street. The houses with the balconies get their rooms better lighted and ventilated than those with the verandahs. There is no encroachment on and narrowing of the public way. Masonry verandahs projecting on to the street were first constructed as a concession and privilege. Now it is almost looked upon as a right which permits the builder to construct in a three or four-storied house 2 or 3 extra rooms at the expense of the Government, *i.e.*, on Government land, because the verandahs become practically rooms of the house. If a builder desires to attach verandahs to his house he should be allowed to do so only on condition that the verandahs do not encroach on Crown land. Similarly so in regard to balconies. The erection of balconies on narrow streets only renders these streets narrower and should be discontinued.

General Statement regarding Design of Chinese Houses.

21. From the foregoing it will be gathered that the Chinese tenement houses in Hongkong differ in style from the European. They also differ from the ordinary Chinese houses in Canton or other Chinese city, where the buildings are not more than two storeys in height and often not more than one. By some gradual process of evolution they have taken on the worst features of both kinds of houses and none of their best. The tenement houses in Hongkong consist of several storeys, each storey containing one long room lighted at each end by a window but without lateral windows. Each room is subdivided into cabins called cubicles which accommodate an entire family. The room on each floor communicates in the rear by a bridge with the kitchen which is separated from the house by a small yard; and in front with a masonry verandah which encroaches on the public street and which being separated by partitions from the adjoining houses is used as an additional room for the house.

The length of room without lateral windows, the kitchen buildings in the rear and the smallness of the back-yard, by obstructing the free access of light and air cause the two lower storeys at least to be dark and badly ventilated. The verandahs in front still further increase this undesirable condition and the cubicles in the

room intensify it to such an extent that none of the rooms are healthy habitations. The cubicle system leads to overcrowding in its worst form and, with the absence of light and fresh air, under its worst conditions, for with the existing design of buildings whenever there are more than two cubicles in a room even in the upper storeys the compartment is dark and devoid of fresh air. With darkness, absence of fresh air and overcrowding it is impossible to keep them clean.

New Designs.

22. In order to secure lateral windows to the rooms of Chinese houses and so provide a window for each cubicle, designs of various kinds have been sent to the Building Authority and several of these are now reproduced. They show that the problem is not an insoluble one and that the difficulties connected with the proper housing of the Chinese are not insurmountable.

23. Plate XIV represents an improved type of Chinese houses designed by the Honourable W. CHATHAM, Director of Public Works. It solves the cubicle question in the room, for it gives to each a window which will permit of sufficient amount of light and ventilation in the cubicle. The only objection to the building as a whole is that there is no provision for a back-yard, which is an important place for the inhabitants of the house if they are not to do their washing and carry on their general domestic work in the back-lane. Besides in a back-yard a water pipe can be placed for the use of the inmates instead of as now having a water pipe for every storey with extravagant waste and consequent scarcity in the dry season.

24. Plate XV is a design sent in by WM. DANBY, Esq., M. Inst. C.E., to the Chairman of the Committee *re* the Housing of the Chinese, as far back as 10th July, 1894. It is an excellent design and plan not only intending to cover the question of cubicles but also that of the relation of houses to one another. We do not however agree with Mr. DANBY as to the number of persons he thinks these houses would contain and yet remain in a sanitary condition. He would allow 21 square feet for each person; 30 is the existing rule but it ought not to be less than 50 square feet. As Mr. DANBY's communication to the Housing Committee is important it is reproduced in the Appendix.

25. Plate XVI represents a design by Messrs. PALMER & TURNER. It has many advantages in its arrangements especially with reference to the staircase which in the ordinary type of house is excessively steep and narrow as well as being dark, but the amount of yard or courtyard is not sufficiently wide for each house. Instead of being 11 feet it should be at least 15 with a certain amount in the rear extending the width of the house and courtyard.

OVERCROWDING.

26. There are two kinds of overcrowding in Hongkong—one produced by the close proximity of the houses, crowding the occupants of the houses on a small area; the other by too many inmates occupying one house.

Both of these may occur apart from one another but it is usual for them to be found together producing conditions of the worst kind. Plate I, showing a block of houses in Health District No. 5, furnishes an example of both kinds, for not only are the houses crowded together thus raising the density of population on the area, but the houses themselves are overcrowded with people. The interior of this block should be resumed and one or more streets cut through it so that the remaining buildings can be laid out on sanitary principles.*

There are many smaller areas like it, which can be rectified only by removing every other row of buildings. The latter process would reduce the surface overcrowding, but it would not affect the overcrowding of the people in the

*Since this report was drafted a number of the houses in this area have been destroyed by fire and it is very important that advantage should be taken of the opportunity thus afforded to carry out the necessary reforms.—W. J. S.

houses, which still remains. To prevent overcrowding it is accordingly necessary not only to limit the number of houses to be built on a given area, but also to limit the number of people that shall occupy a room. The present limit of not less than 30 square feet is too low a standard and should be raised to 50 square feet.

No definite rules in regard to cubic space per head are laid down in England except with reference to common lodging-houses which are required by the bye-laws to be vacated, the windows freely opened, and beds stripped during certain hours of every day. But the Imperial Public Health Act defines as a "Nuisance" any house or part of a house so overcrowded as to be dangerous or injurious to the health of the inmates and it is left to the discretion of the Sanitary Authority on the advice of the Medical Officer of Health to determine what constitutes overcrowding; their decision is of course subject, in the event of legal proceedings, to the decision of the Magistrates who would be naturally guided by expert evidence.

In a tropical country and with an Eastern population whose tendency is to herd together, the conditions are so different from those obtaining in England that it is desirable not only to have definite rules laid down for all classes of native dwelling houses but also to fix the minimum at a proportionately higher level. This view was taken by one of us in 1882 and it was then recommended that 600 cubic feet of air space should be the minimum allowance per head; 50 square feet of floor space per head is the minimum recognised in India for all jails.

In order that the unbuilt over areas of Kowloon and the New Territory shall not get into the same insanitary and overcrowded state as the City of Victoria, it is important that they should be laid out on definite lines, and with this object in view it is recommended that a map should be drawn showing existing and projected streets and scavenging lanes planned out on lines which will ultimately when the areas are built on secure a healthy and well ventilated town.

PROPOSED BILL.

27. In preparing the draft Bill which has for its object the avoidance of the necessity for further sanitary legislation, for the next few years, it was soon found that the only practicable way of carrying out this proposal was to consolidate the whole of the Sanitary and Building Ordinances in one Bill, for the Public Health Ordinance of 1901 was found to contain many clauses relating to construction, some of which, in our opinion, most certainly need amendment. This consolidation however is quite in keeping with the construction of the Imperial Public Health Act of 1875 and subsequent amending Acts which deal not only with sanitary administration but also with the regulation of streets and buildings and we are sure that to have all the provisions of the local law on sanitary and constructional matters within the pages of one Ordinance will prove very useful not only to the officials whose duty it is to see that the law is complied with, but also to the Architects and others who design and erect the buildings. The Bill is divided into six parts:—Part I being Preliminary, dealing mainly with definitions; Part II dealing with Public Health Administration; Part III with Building Construction; Part IV with the rights of adjacent owners; Part V with the Resumption of Property by the Crown for sanitary reasons; and Part VI with Penalties and Contraventions.

In Part II provision is made, in the constitution of the Sanitary Board, for a Sanitary Commissioner, as we are convinced that the Sanitary Department should be administered by an officer who should devote the whole of his time to such duties, and who should be ex-officio the Chairman of the Board and Head of the Department. This officer should be a medical man specially trained and skilled in sanitary affairs, and responsible to the Government for the efficient administration of the Department. Certain duties which are now performed by the Medical Officer of Health, in the name of the Board, have been transferred to the Sanitary Commissioner, but care has been taken not to encroach in any way upon the powers

of the Board, as we consider that such a Board is capable of doing much good work on behalf of the Colony. The Bill accordingly imposes upon the Sanitary Commissioner the duty of dealing with all nuisances and sanitary defects of whatever nature, but leaves to the Board the power of granting licences, permits, exemptions, etc., of controlling the policy of the Department and of advising the Government as to the sanitary needs of the Colony. We consider moreover that there should still be a Medical Officer of Health and an Assistant Medical Officer of Health who, with the Surveyor and the Colonial Veterinary Surgeon would continue to be the chief executive officers of the Board. It has moreover been deemed necessary to transfer the Port Health Officers to the Sanitary Department as their duties are essentially sanitary and their separation only tends to render inefficient the work of sanitary administration.

With regard to the Building clauses contained in Part III of the Bill, careful consideration has been given to the Report submitted by the local Architects, and many of their suggestions, have been adopted such for instance as the non-application of the Ordinance to buildings already planned (within certain limits of time) and contracted for, the right of an authorized architect to appear before the Executive Council before his name is removed from the list, the question of the rights of adjacent owners, and other matters of smaller moment to which our attention has been directed by the said report.

With regard to the setting back of buildings in narrow private streets, it has not been thought necessary to go beyond the law of 1889, which required an open space of seven and a half feet at least as measured from the middle of the lane or street, to be left in front of any such new building.

The provisions of the European Reservation Ordinance of 1888 are incorporated (with some amendment of the boundaries) in Part III and it will be found that several of the clauses in this Part relating to construction only apply to buildings outside such reservation, as they have been especially drawn to meet the conditions which obtain in Chinese tenement houses and others of that class.

With regard to the resumption of insanitary property, many blocks of buildings throughout the City of Victoria will undoubtedly have to be gradually bought up by the Government and the areas laid out in a more sanitary manner, more open space around each building being an especial desideratum in many of the most congested areas, and we have accordingly incorporated in this Bill the clauses of the Crown Lands Resumption Ordinance which appear to follow closely the provisions of the Imperial Housing of the Working Classes Act and to provide all the necessary powers for the resumption of insanitary or obstructive buildings. In such cases compensation for resumption is always given, but the Bill does not propose to offer compensation to the owners for the erection of sanitary dwellings on land at present unoccupied, nor for the re-erection, on land already occupied, of dwellings of an improved type to those now in existence. The right of an owner of property to re-erect dwellings of an insanitary type, because his present dwellings are insanitary, should not be admitted.

In regard to the question of cubicles it should be specially noted that the Bill does not prohibit cubicles, but regulates them by requiring that every cubicle shall be provided with a window into the external air. As every cubicle is a dwelling compartment for one or more persons, and often for an entire family, it is only in accordance with the ordinary laws of sanitation to require that it shall be separately lit and ventilated by a window into the external air. The law has required since 1894 that every "habitable room" shall be so provided* and it is not in accordance with the spirit of that law that a dwelling-room with one or two windows, should be subdivided into a number of rooms, each occupied by a family, of which only the room

* Ordinance 15 of 1894, s. 8.—(a) Every person erecting a new building shall provide every habitable room therein with one window, at least, opening directly into the external air, and he shall cause the total area of such window or windows, clear of the window frames to be at least one-tenth of the floor area of every such room.

at the front of the building and possibly the one at the back can have windows into the external air. No person can legitimately claim the right to house tenants in windowless rooms, merely with a view to increasing the rental of his property, and where such has been done, no claim to compensation should be entertained for the discontinuance of this dangerous practice.

Every material amendment of the present law has, we believe, been enclosed within square brackets so that the reader may see at a glance what is new and what is not, and the following is a table showing the arrangement of the clauses, together with a brief resumé of the amendments with notes of the reasons why they have been incorporated in this Bill, where such reasons appear to be called for.

HONGKONG.

THE PUBLIC HEALTH AND BUILDINGS BILL.

ARRANGEMENT OF CLAUSES.

PART I.

Preliminary.

Section.

1. *Short title.*
2. (1) *Repeal of Ordinances.* (2) *Bye-laws continued in force.* (3) *Rules and Regulations continued in force.* (4) *Existing officers to continue to hold their appointments.*
3. *Contracts.* Any contracts entered into under the existing building laws may be carried out under such laws if the buildings are commenced within three months of the approval of the plans by the Building Authority.
4. *Government wells, buildings and works exempt.*
5. *Rights or liabilities between landlord and tenant.*
6. *Definitions.* A number of new definitions have been included, which have been taken mostly from the Imperial Acts.
7. *List of "authorized architects."* This clause has been framed with a view to preventing the erection of buildings by incompetent persons.

PART II.

Public Health.

CONSTITUTION AND GENERAL POWERS OF THE SANITARY BOARD.

8. *Constitution of the Sanitary Board.* We have provided here for the appointment of a Sanitary Commissioner who shall be ex-officio Chairman of the Board. In order to preserve a majority of unofficial members on the Board we have been reluctantly compelled to provide that the Medical Officer of Health should cease to be a member of the Board, his seat being taken by the Sanitary Commissioner, although we consider that the services of the present Medical Officer of Health on the Board have been invaluable. In any case, however, the Medical Officer of Health should attend the meetings of the Board as their professional adviser, and chief executive officer.
9. *Rules for election of certain members of the Board.*
10. *Names of members to be gazetted.*
11. *Substitute members.*
12. *Vacancies on the Board.*
13. (1) *Board meetings.* (2) *Quorum.*
14. (1) *Standing orders.* (2) *Appointment of select committees.*
15. (1) *Delegation of powers to Sanitary Commissioner or to select committees.* (2) *Failure to comply with orders of Sanitary Commissioner or of select committee.*
16. *Emoluments and powers of Sanitary Commissioner.*
17. *Matters with regard to which the Board has power to make bye-laws.*
18. *Legislative Council to approve bye-laws.*

SANITARY STAFF AND ITS POWERS.

19. *Constitution of Sanitary staff.*
20. *Evidence of appointment of any officer of the Board.*
21. *Power of Medical Officers of Health and Sanitary Surveyors to enter and inspect premises.*
Proviso.
22. *Power of Medical Officers of Health to enter and inspect without notice.*
23. *General power of Board's officers to inspect.*
24. *Special inspections to ascertain breaches of certain sections.*

OBSTRUCTION OF MEMBER OR OFFICER OF THE BOARD.

25. *Penalty for assaulting member or officer of the Board.*

NUISANCES.

26. *Definition of nuisance.*
27. (1) *Entry to inspect nuisances.* (2) *Notice of such entry to be given if objection is raised.*
28. *Penalty for refusing admission after due notice.*
29. *Sanitary Commissioner to serve notice requiring abatement of nuisance.*
30. (1) *Sanitary Commissioner may serve notice directing compliance with bye-laws.* (2) *Proceedings without notice.*
31. *Board may review notice.* This clause provides a right of appeal to the Board by any person dissatisfied with the action of the Sanitary Commissioner.
32. *On non-compliance with notice, complaint to be made to a Magistrate.* *Proviso.* It has been thought advisable to give the Sanitary Commissioner power to abate certain nuisances forthwith, if the notice is not complied with, instead of making application to a Magistrate for an order and penalty; this power has been taken more especially in regard to nuisances intimately associated with the dissemination of plague.
33. (1) *Power of Magistrate to make an order dealing with the nuisance.* (2) *Penalty.*
34. (1) *Order of prohibition of use, etc., of building unfit for human habitation.* (2) *Closure of premises which have become a nuisance to the neighbourhood.* The latter clause is new, as there appears to be at present no powers for dealing with such premises, and it is possible that offensive or objectionable trades might be carried on in undesirable localities, and yet not fall within the definition of "Offensive trades" given in section 6.
35. *Penalty for contravention of order of Magistrate, or for defacing any copy of such order.*
36. *Form of notices.*
37. *Manner of serving notices.*

COMMON LODGING-HOUSES.

38. *Common lodging-houses to be registered and the keeper licensed.*
39. *Penalty for false statements.*
40. *Inspection of common lodging-houses.*

PUBLIC WASHERMEN.

41. *Regulation of public washermen.* This is a new clause to enable the Board to carry out its duties in regard to the protection of the public water supplies.

FACTORIES, WORKSHOPS, ETC.

42. *Establishment of factories or work-places.*
43. *Establishment of dangerous or offensive trades.*
44. *Nuisances in factories, workshops or work-places.*
45. *Prohibition of occupation for domestic purposes of any building in which a dangerous or offensive trade is carried on.* The four foregoing clauses are new; it is very desirable that cement works, white lead factories, alkali works and so on, should not be established in overcrowded parts of the Colony, nor that such premises should be occupied as dwellings without some control by the Sanitary Authority.

BASEMENTS.

46. *Basements may not be occupied without permission.*
47. *Filling in of basements which are insanitary.* This is a new clause which appears to be very necessary in connection with the question of the dissemination of plague by rats.

OVERCROWDING.

48. *Overcrowding defined. Overcrowding in European Reservation or Hill District.*
49. *Overcrowding prohibited.*
50. (1) *Steps to be taken to abate overcrowding.* (2) *Magistrate may make order for abatement.*
(3) *Subsequent inspection.*

51. *Common kitchen not to be used as a sleeping room.*
52. *Calculation of cubic space in case of children.*
53. *Limit of fittings for sleeping accommodation.* In these clauses dealing with overcrowding the minimum floor space per head has been increased from thirty feet to fifty feet, and the minimum cubic space from four hundred feet to six hundred feet, as recommended by one of us in 1882.

KEEPING CATTLE, SWINE, ETC.

54. *Keeping of cattle, swine, etc., requires a licence.*
55. *Transport of animals, etc.*

COMPENSATION FOR SLAUGHTER OF INFECTED ANIMALS.

56. *Compensation for infected animals slaughtered.*
57. *Value to be fixed by Colonial Veterinary Surgeon.*

DEPÔTS FOR ANIMALS.

58. *Cattle Depôts to be provided by the Government.*
59. *Grazing may be prohibited.*

SLAUGHTER-HOUSES.

60. *Establishment of slaughter-houses and the letting thereof.*
61. *Prohibition of the establishment of private slaughter-houses.*
62. *Privilege of slaughtering animals.*
63. *Sub-letting prohibited.*
64. *Slaughtering except in slaughter-houses prohibited.*
65. *Unauthorized fees or charges prohibited.*
66. *Marking of animals for slaughter.*
67. *Only marked animals may be slaughtered for human food.*
68. *Forging marks a criminal offence.*
69. *Passing of un-marked animals into a slaughter-house prohibited.*
70. *Stamping of beef and mutton.*
71. *Forging stamps a criminal offence.*
72. *Slaughter-houses open to inspection.*

MARKETS.

73. *Establishment of markets. Prohibiting establishment of unauthorized markets.*
74. *Buildings in markets limited.*
75. *Letting of market buildings by the Registrar General.*
76. *Sub-letting prohibited.*
77. *Alterations to market buildings require sanction of Director of Public Works.*
78. *Repairs to market buildings by lessee may be ordered by Magistrate.*
79. *Sale of certain articles outside markets prohibited.*
80. *Seizure of unstamped meat by officers of the Board.*
81. *Exceptions to the prohibition of sales outside markets.*
82. *Unauthorized fees or charges prohibited.*
83. *Markets open to inspection.*

UNWHOLESOME FOOD.

84. *Sale of unwholesome food prohibited.*
85. *Seizure of unwholesome food. Penalty.*
86. *Inspection of dairies. Power to prohibit supply of milk in certain cases.*
87. *Penalty for refusal to permit inspection.*
88. *Penalty for allowing infected persons to milk animals or assist in the conduct of the dairy or reside therein.*

REMOVAL OF INFECTED PERSONS.

89. *Removal of infected persons to hospital.*
90. *Conveyance of infected persons in public vehicles. Penalty.*

CEMETERIES.

91. *Chinese cemeteries to be appointed. Penalty for improper interment.*
92. *List of authorized cemeteries. Penalty for burials elsewhere.*
93. *Closing of cemeteries by the Governor in Council.*

RECOVERY OF EXPENSES BY THE BOARD.

94. *Reimbursement of expenses to the Board.*
95. *Method of recovery of expenses by the Board.*

CERTIFICATES.

96. *Granting of certificates, etc.*

PART III.

Buildings.

BUILDING MATERIALS.

97. *Building materials specified.*

EXCEPTIONAL STRUCTURES.

98. *Construction of exceptional buildings regulated.*
99. *Structures of glass, iron, etc., to be subject to approval of Building Authority.*
100. *Buildings in districts outside an urban district may be of wood.*

WALLS.

101. *Construction of walls regulated.*
102. *External and party walls, thickness of.* The required thickness of external and party walls has been slightly increased on the recommendation of the Director of Public Works.
103. *Limitation of length of walls. Walls over 76 feet in height require approval of Building Authority.* The alteration in the limit of height of walls from 80 feet to 76 feet has been made partly because the height of such walls is now measured from the level of the adjacent foot-path instead of as formerly from the top of the footings, and partly to accord with the provisions of section 185 sub-section (5) of the same Ordinance. In any case the Building Authority has power to permit walls of a greater height.
104. *Thickness of cross walls to be two-thirds that of main walls.*
105. *Damp proof courses must be provided.*
106. *Construction of foundations.*
107. *Party walls to be carried up above roof.*
108. *Openings through party or external walls.*
109. *Lath and plaster walls prohibited.* Such walls are most undesirable owing to the intimate connection between rat-infested premises and plague, and the facilities which such walls give to the breeding of rats within the building.

BONDING FOR THE WALLS OF DOMESTIC BUILDINGS.

110. *Bonding of walls provided for.* This is a new clause inserted on the recommendation of the Public Works Committee of the Legislative Council.

BRESSUMMERS AND LINTELS.

111. *Bearings of bressummers and lintels.*

CONCRETING OF GROUND SURFACES.

112. *Prohibition of habitation of domestic buildings until impermeable floors have been provided. Proviso.*
113. *Repairs to impermeable material over ground surface.*

FLOORS.

114. *Level of ground floors to be above level of ground outside.*
115. *Distance between floor timbers of contiguous buildings.*
116. *Floors to rest on corbels of brickwork or stonework.*
117. *Space to be left between floors defined.* A space of nine feet only between floors in a tropical country is inadequate and the space has accordingly been increased in this clause.
118. *Ventilation under boarded floors in the lowest storey.* A space of a few inches only under a wooden floor is inadequate and the requirements of the law in this respect have accordingly been increased to two feet six inches, thus rendering the space accessible and capable of being kept cleansed and free from rats.
119. *Regulations governing mezzanine floors.*
120. *Wooden floors to be made reasonably water-tight.*
121. *Cement skirtings required.* This clause has been inserted so as to provide an additional protection against rats in the Chinese quarter.

STAIRCASES.

122. *Regulations governing tread and rise of stairs.*

Ceilings.

123. *Ceilings prohibited outside European reservation.* This is intended as a further protection against rats in the Chinese quarter.

CORBELLING.

124. *Corbels to be of stone or brick.*

ROOFS.

- 125. *Covering of roof to be of incombustible material.*
- 126. *Space between roof timbers of contiguous buildings.*
- 127. *Platforms on roof prohibited.*
- 128. *Roofs to rest upon brickwork or stonework.*

WOODWORK.

- 129. *Bond timbers or wood plates not to be built into walls.*
- 130. *Timber or woodwork near flue or chimney opening prohibited.*

ARCHES.

- 131. *Regulations governing construction of arches.*

PROJECTIONS, ETC.

- 132. *Material for coping, cornices, etc.*
- 133. *Eaves-gutters and rain water down-pipes to be provided.*
- 134. *Projections into public thoroughfares prohibited. Proviso in the case of public buildings.*

VERANDAHS, BALCONIES AND AREAS.

- 135. *Encroachments on Crown land prohibited.* We are most emphatically of the opinion that all encroachments upon Crown land by means of verandahs, balconies etc., should be absolutely prohibited in future. Such structures very materially lessen the width of the public streets and are thus an important factor in the darkening of the lower floors of dwelling houses. All such structures should be provided by owners on their own land.

RESTRICTION ON PARTITIONS, OBSTRUCTIONS AND ENCLOSURES IN
VERANDAHS AND BALCONIES.

- 136. *Verandahs and balconies not to be enclosed.* This clause is intended to cover all existing verandahs and balconies on Crown land or over any street.

KITCHENS, FIREPLACES AND CHIMNEYS.

- 137. *Kitchen accommodation must be provided in domestic buildings.*
- 138. *Limitation of extent of kitchens in tenement houses.*
- 139. *Construction of chimney of fireplace.*
- 140. *Fireplaces adapted for use of charcoal to have hoods.*
- 141. *Floors under oven, stove or fireplace to be incombustible.*
- 142. *Chimneys not to be fired near woodwork.*
- 143. *Thickness and height of chimney above roof defined.*
- 144. *Corbelling and foundations of chimneys regulated.*
- 145. *Thickness of back of chimney opening defined.*

WINDOWS, CUBICLES AND ROOMS.

- 146. *Windows in rooms required.*
- 147. *Limitation of depth of buildings.* One of the most important causes of the insanitary condition of many of the dwellings in this Colony is the excessive depth of buildings in relation to their width, and this clause is designed to prevent the further erection of domestic buildings of great depth without lateral windows. The enforcement of this clause may occasionally necessitate the resumption of a portion of a building-lot by the Crown, but in view of the insufficient width of many of the public streets in the Colony, and the lack of open spaces this resumed land can well be utilized to increase the width of the public street or streets abutting on such lot or be reserved as an open space for the improvement of the neighbourhood. The option of resuming any portion of a building-lot in connection with this clause should rest with the Government, as it is conceivable that the land may be laid out in several different ways, and it is only suggested that resumption might ensue when the building-owner can make no use whatever of a portion of his land.
- 148. *Cubicles without windows prohibited in domestic buildings hereafter erected.* Very little improvement in the sanitary condition of the vast majority of the Chinese dwellings in the Colony can be hoped for until this question of cubicles is dealt with in a rational manner, and we consider that it will be no great hardship to require all cubicles in buildings hereafter erected to possess windows into the external air.
- 149. *Requirements as to cubicles in existing buildings.* The number of cubicles, not separately lit by windows or skylights on any storey has been limited to two, and in lieu of the present sliding scale as to the height of the partitions, the Bill provides for a maximum height of six feet. The size of the cubicles has also been amended to accord with the proposed increase in the area of floor space to be allowed per head by clause 48 of this Bill.
- 150. *Obstruction of windows prohibited.*

PRIVIES, WATER CLOSETS AND LATRINES

151. *Construction and dimensions of privies regulated.*
152. *Ventilation of privies and latrines and rendering of walls with cement.*
153. *Construction of floors of privies and latrines specified.*
154. *Privies and latrines not to be connected directly with drain or sewer.*
155. *Direct connection of water-service with privies, etc., prohibited.*
156. *Receptacle and seat in privy required.*
157. *Construction of water closets and urinals without permission prohibited.*
158. *Privies to be provided in factories and other industrial establishments.*
159. *Latrines to be provided for tenement houses.*
160. *Inadequate provision of latrines to be dealt with by Sanitary Commissioner.*

PUBLIC LATRINES.

161. *Sanction of the Board to be obtained before erection of a public latrine.*
162. *Application by Board to Government for additional public latrines.*
163. *Notification of intention to erect a public latrine.*
164. *Objections to such erection.*
165. *Resolution of the Legislative Council necessary where objection is made.*
166. *No injunction to be granted or suit to be brought in certain cases.*
167. *Existing Government public latrines protected from injunction.*
168. *Board to control Government public latrines.*
169. *Saving clause preserving existing rights.*

OPEN SPACES, SCAVENGING LANES, ETC.

170. (1.) *Open spaces to be provided for existing buildings.* (2.) *Buildings with two main front-ages.* (3.) *Modifications in special cases.* (4.) *Obstructions in such open spaces prohibited.*
171. *Open space or area to be provided between new building and hill side.*
172. *Subsoil drainage of such open spaces or areas.*
173. *Structures in areas prohibited.*
174. *Open spaces in the rear of new buildings on land not yet sold by the Crown.*
175. *Open spaces in the rear of new buildings on land already sold by the Crown.* The Bill provides that the open spaces in the rear of new buildings shall bear a definite proportion to the roofed over area of the buildings and if the mean of the three scales which now exist (namely section 54 of the Public Health Ordinance of 1901, section 56 of the same Ordinance, and the Schedule of the Praya Reclamation Ordinance No. 16 of 1889, all three of which should be now repealed) be taken, it will be found that the new scale is not much in excess of the existing ones. It will be observed moreover that the erection of one-storey kitchens, bath-rooms and latrines in the open spaces, or yards is permitted, which is an advantage not permitted by the existing sanitary laws.
176. *Further provisions in regard to open spaces around buildings on land not yet sold by the Crown.*
177. *Further provisions in regard to open spaces around buildings on land already sold by the Crown.* It appears to be necessary, especially in connection with buildings abutting on private streets, to provide for the preservation of the open spaces in front of buildings as well as in the rear.

PUBLIC STREETS.

178. *Preparation of plan of projected public streets and lanes by the Building Authority.* The Ordinance should definitely lay down that a plan is to be prepared of all projected streets in the districts not yet built upon but which are available for purchase, so that intending purchasers of Crown land may be in a position to design their buildings to the best advantage.

PRIVATE STREETS.

179. *New private streets to be approved by the Building Authority.*
180. *Width of new private streets regulated.*
181. *Space in front of new buildings in private streets.*
182. *Obstruction of streets by buildings prohibited.*
183. *Maintenance and lighting of private back streets and lanes.*
184. *Maintenance and lighting of private front streets and lanes.*

HEIGHT OF BUILDINGS.

185. *Limitation of height of buildings.* It is essential that the height of all buildings hereafter erected (with perhaps one small exception,) should be limited to a maximum of one and a half times the width of the street on which such buildings front, and in case of land not yet

sold by the Crown, we advise that the height be limited to the width of the street. The exception referred to relates to certain private streets which received special consideration in the Insanitary Properties Ordinance of 1894, and reference to these will be found in the proviso to sub-section (3).

186. *Method of determination of height of buildings.*

DRAINAGE WORKS.

187. *Drains must be provided in new buildings.*
188. *All drainage works to be carried out by the Board or by persons approved by the Board.*
189. *Drains in existing buildings to be amended or reconstructed if defective.*
190. *Groups of buildings shall be drained in combination if so required by the Sanitary Commissioner.*
191. *Owners to connect drains with main sewers.*
192. *Suspected drains to be opened by an officer of the Board.*
193. *House drains required in villages and rural districts.*
194. *Open drains to be provided in rural districts, wherever feasible.*
195. *Sumps to be provided where there is no public drainage system.*
196. *Drain connections with Government main sewers to be regulated by the Director of Public Works.*

DESIGN OF BUILDINGS.

197. *Erection of Chinese domestic buildings within European Reservation or Hill District prohibited.*
198. *Building Authority to inspect any such building in respect of which a complaint is received.*
199. *Restriction does not apply to the residence of Chinese within the European Reservation or Hill District.*
200. *Preserving existing rights of the Government to regulate type of buildings to be erected.*

OCCUPATION OF NEW BUILDINGS.

201. *Occupation of new building without a certificate prohibited.*

DANGEROUS BUILDINGS.

202. *Shoring and fencing of a dangerous building.*
203. *Taking down of a dangerous building.*
204. *Shoring or taking down of a dangerous building at the cost of the owner.*

HOARDINGS AND SCAFFOLDINGS.

205. *Hoardings and scaffoldings in thoroughfares require permission of Building Authority.*

MATSHEDS AND OTHER INFLAMMABLE STRUCTURES.

206. *Inflammable structures may not be erected without permission.*

BLASTING.

207. *Precautions to be adopted when blasting stone, etc.*

EARTH CUTTING.

208. *Regulations as to earth cutting.*

TIMBER YARDS.

209. *Timber yards to be enclosed.*

WELLS AND POOLS.

210. *Wells may only be sunk with permission of Building Authority.*
211. *Excavations allowing stagnant water prohibited.*
212. *Closing of wells which are insanitary.*

NULLAHS, STORM WATER CHANNELS AND DRAINS.

213. *Building over drains without permission prohibited.*
214. *Covering in of nullahs prohibited.*
215. *Conditions to be imposed by the Director of Public Works.*
216. *Interference with any drain, nullah, catchwater or water channel prohibited.*

BOUNDARY AND RETAINING WALLS.

217. *Construction of boundary or enclosure walls.*
218. *Construction of retaining walls.*

PLANS, DRAWINGS AND NOTICES.

219. (1) *Plans, drawings, etc., to be submitted in connection with all new works. Block plan to be submitted.* (2.) *Copy of plans, etc., to be deposited with Building Authority.* (3) *Copy of plans, etc., showing drainage works to be deposited with Sanitary Board.* (4) *Misrepresentations in plans, etc., punishable.* (5) *Power of Magistrate to require compliance with the Ordinance.* (6) *Penalty.*
220. *Notice of commencement or resumption of works.*
221. *In case of emergency notice may be given after commencement of works.*

ALTERATION OR ADDITION TO EXISTING BUILDING OR WORKS.

222. *Certificate of authorized architect required before alteration or addition to existing building or works.*

REFERENCE OF PLANS TO THE SANITARY COMMISSIONER.

223. *Plans and drawings respecting building or works to be referred to the Sanitary Commissioner.*

POWERS AND DUTIES OF THE BUILDING AUTHORITY AS TO ENTRY AND INSPECTION.

224. *Power to enter and inspect buildings and works.*

STOPPAGE OR DIVERSION OF TRAFFIC.

225. *Director of Public Works may stop or divert traffic.*

BUILDING NUISANCES.

226. *Building nuisances defined.*
227. *Notice to abate building nuisance. Proviso.*
228. *Magistrate's order enforcing abatement of nuisances by the Building Authority. Expenses consequent thereon.*
229. *Recovery of expenses of abatement of nuisance by sale of materials.*
230. *Distress in case of non-payment of expenses.*
231. *Saving of other remedies for nuisances.*

SERVICE OF NOTICE, SUMMONS OR ORDER.

232. *Method of service of notice, summons or order.*

PART IV.

Rights of Building and Adjoining Owners.

233. *Provisions concerning buildings on line of junction when adjoining lands are unbuilt on.*
234. *Rights of building owner in relation to party structures.*
235. *Requirements of adjoining owner in relation to party structures.*
236. *Notice to be given by building owner before works are commenced.*
237. *Differences between building owner and adjoining owner.*
238. *Right of entry of building owner.*
239. *Underpinning or strengthening of foundations of adjoining building.*
240. *Adjoining owner may require security to be given.*
241. *Expenses to be borne jointly by building owner and adjoining owner. Expenses to be borne by the building owner.*
242. *Statement of expenses to be furnished by building owner.*
243. *Difference between building owner and adjoining owner as to expenses.*
244. *Failure by adjoining owner to express dissatisfaction to be deemed acceptance.*
245. *Failure by adjoining owner to contribute to expenses leaves building owner possessed of sole property.*
246. *Adjoining owner liable for expenses incurred on his requisition.*
247. *Preserving all other easements and rights in regard to party structures.*

PART V.

Resumption.

248. *Power of resumption by the Crown defined.*
249. *Constitution of Board of Arbitrators.*
250. *Notification of constitution of Board of Arbitrators.*
251. *No suit to lie but claims to be sent in writing to the Board of Arbitrators.*
252. *Consideration of claims.*
253. *Powers of the Board of Arbitrators.*
254. *Assessment of compensation where property is resumed. Proviso. Proviso where insanitary property is resumed.*

- 255. *Notices by Board of Arbitrators.*
- 256. *No appeal from decision of majority.*
- 257. *Vacancies on Board of Arbitrators.*
- 258. *Re-grant of lands etc.*
- 259. *Compensation to bear interest until paid.*
- 260. *Notice of resumption to be conclusive evidence of a resumption for a public purpose.*
- 261. *Arrangement with owner to re-construct buildings.*
- 262. *Power of Board of Arbitrators to regulate proceedings.*
- 263. *Saving of rights of resumption under Crown Leases.*

PART VI.

Contraventions and Penalties.

- 264. *Contraventions.*
- 265. *Recovery of Penalties.*
- 266. *Penalty for building nuisances.*
- 267. *Penalty for refusing to obey Magistrate's order or for obstructing Building Authority.*
- 268. *Penalty for other contraventions.*
- 269. *Imprisonment in default of payment of penalties.*
- 270. *Liability of Secretary or Manager of a Company.*
- 271. *Proceedings against several persons.*

SPECIAL POWERS OF MAGISTRATE.

- 272. *Closure of premises by order of a Magistrate.*
- 273. *Power of Magistrate to order removal of illegal structures. Appeal to the Governor-in-Council.*
- 274. *Appeal to the Governor-in-Council against decision of the Building Authority.*

REGULATIONS.

- 275. *Governor-in-Council may make Regulations.*

APPLICATION OF ORDINANCE.

- 276. *Ordinance not to apply to New Territories except New Kowloon unless Order in Council shall so direct.*

SCHEDULE A.

Enactments repealed.

SCHEDULE B.

Bye-laws governing Bakehouses; Basements; Cattle-sheds, Pigsties etc.; Cemeteries; Common Lodging-houses; Dairies; Depôts for Cattle, Pigs, Sheep and Goats; Disinfection of infected Premises; Domestic cleanliness and Ventilation; Drainage Entry and Inspection of Buildings; Importation of Animals; Latrines; Laundries; Night-soil carriers; Markets; Notification of infectious Disease; Overcrowding; Offensive Trades; Opium smoking Divans; Poisons; Prevention or Mitigation of epidemic endemic or contagious disease; Prevention of the dissemination of rats; Slaughter-houses; Removal of patients; Scavenging and Conservancy; Streets (private), Obstruction of; Water-closets.

SCHEDULE C.

Misshred Regulations.

SCHEDULE D.

Regulations as to obtaining Stone, Earth or Turf from Crown Land.

SCHEDULE E.

Rules for the election by the rate-payers of members of the Sanitary Board.

SCHEDULE F.

Form of notice to abate a Public Health Nuisance.

SCHEDULE G.

Form of notice of intention to commence or resume any building or works.

SCHEDULE H.

Form of notice to abate a building nuisance.

We would ask that the Bill may be referred to the Attorney General so that its phrasing may be altered, where necessary, to the legal form, and any flaws in its construction rectified, and we believe that if the Government can secure its adoption by the Legislative Council with only such alterations as the Attorney General may deem necessary, the Colony will possess an Ordinance which will gradually secure a great improvement in its general sanitary condition, and will lead to the suppression of those diseases which are dependent upon overcrowding and insanitary conditions for their propagation.

We have the honour to be,

Sir,

Your obedient Servants,

OSBERT CHADWICK,

M. INST. C.E., M.I.M.E., C.M.G.

W. J. SIMPSON,

M.D., F.R.C.P.

Appendix.

Mr. W. Danby to Chairman of Committee re the Housing of the Chinese.

HONGKONG, 10th July, 1894.

Sir,

Having given much thought and attention for many years past to the practicability of introducing a better and more sanitary type of Dwelling House for the Chinese Working Classes of this Colony, I should be glad if you would lay the following suggestions, with accompanying plans, before the Committee, now sitting on the subject of House Accommodation for the Working Classes.

2. Before proceeding further, however, I may state, that I have probably designed and superintended the erection of more Chinese Houses in the Colony, than any other Architect, and am consequently well acquainted with their many defects, and the points on which improvements should be insisted upon, and also the objections likely to arise from property owners, when such improvements are first proposed. At the present time, so long as the plans of proposed Chinese Houses comply with the requirements of the existing Building and Public Health Ordinances, we Architects are powerless to introduce such improvements as we should like, if our clients refuse to adopt our suggestions, which they almost invariably do.

3. In preparing the accompanying design, I have adopted a somewhat different type of building, to what we have at present in the Colony, a departure to which at first sight some objections will probably be raised by some of the Chinese owners of property. I have, however, shewn and explained the general design to many Chinese, who after going into it, have expressed themselves much pleased with it, and are of opinion that it is a type of building which would eventually become popular with the Working and Coolie classes.

4. The plans sent herewith have been more especially designed for the large blocks of vacant ground at Kennedy Town, of which the Hon. C. P. CHATER is Crown Lessee, their respective numbers being Inland Lots Nos. 953-954 and part

of Inland Lot No. 906; the Committee will see, however, that the type of building now proposed, can easily be adapted to the new buildings which will have to be erected on the condemned area in Taipingshan, after the Government have resumed the ground, and laid it out on more sanitary and modern lines.

5. My suggestion is to erect blocks of model working class Dwellings, having a large open area in the *centre* for light and ventilation, with streets and wide passages on the outside, and surrounding the premises on all *four* sides (*vide* Drawings) thus securing further light and ventilation.

6. On referring to Drawing No. 2 (which is a detail of Block A on Drawing No. 1) it will be noticed that the General Entrance to the premises is on the side facing the 50-foot Public Street, the Entrance will be 4 feet 6 inches wide opening into an Entrance Lobby (laid in cement concrete) 15 feet long and 14 feet wide, and leading direct into the large Open Area or Yard 39 feet long by 35 feet wide. The caretaker or concierge would reside in this lobby, for which there is ample room, at the front corner of the Blocks, and on the Ground Floor, two shops are shewn, for the sale of Chinese groceries, provisions, &c., &c.

7. At the opposite end of the Yard to the Entrance, a large cook-house (15' x 12') and latrine accommodation is provided, one latrine for *men* only (15' x 12') and one for *women and children* (15' x 8')

The question of *latrine* accommodation is one to which I attach very great importance, hitherto it has almost invariably been neglected both by the Government and owners of property. In all Building Regulations both in Great Britain and other places, you will find provision made for the erection of privies, &c., and that by the "Building Owner." According to the existing Hongkong Ordinances, a building owner can, if he so wishes it, erect say 500 houses in one Block, and there is no provision in any of the Ordinances compelling him to provide suitable latrine accommodation for the occupants of the said houses. The present time, with the lessons taught us by the visitation of the Plague, and when it is proposed to re-construct certain portions of the City, is, in my opinion, a favourable opportunity for introducing new Regulations referring to this matter.

8. As before mentioned, a Special Latrine, with a separate Entrance is provided for women and children. You will probably be informed that women will not go to such places; on enquiry, however, I find that such is not the case, the fact being, as I am creditably informed, that in the Public Latrines now opened in the City (and which latrines are few in number and some long distances apart), no special provision of any kind is made for women and children; they have either to make use of receptacles in their cook-houses or living rooms, or resort to the Latrines used by men.

I respectfully venture to suggest that your Committee should strongly recommend the Government to adopt measures for the improvement of this very unsatisfactory state of things.

9. The proposed latrines would have cement concrete floors, and the walls, for a height of 5 feet would be rendered with neat cement. They would have ample light and ventilation from large doors and openings at each end, thus securing a good current of air through each of them and owing to the ample light in them, there would be no difficulty in keeping them clean and free from offensive smells.

The floors of the cook-rooms immediately above them, would be constructed of cement concrete (carried on *iron* joists) and other materials impervious to moisture.

10. All the cook-houses throughout the building would also be constructed in a manner similar to the latrines, with concrete floors, so that no water could percolate through them, they also would have ample light and ventilation on two

sides, each cooking range would also have a separate flue, which is not usually the case, the smoke from the lower cook-house generally finding its way into and filling the cook-house immediately above it. The new cook-houses, thus having plenty of light and ventilation, and good flues will easily be kept clean and sweet, especially as there will be no dark corners for dirt to accumulate.

11. An iron verandah, 6 feet wide in the clear (or 2 feet wider than the usual iron balconies now permitted in the public streets) is proposed to be erected in the "Open Yard" at the level of each floor, this verandah will give access to all the rooms on each floor.

12. An unusually good, wide and well ventilated, and well lighted general staircase is provided, the steps being of hard wood 4 feet wide (and with iron balusters) enabling the occupants to easily pass each other when ascending or descending. This staircase communicates with each floor of the building. I wish to draw the special attention of the Committee to this staircase, as one of the features of the proposed new buildings. The ordinary staircase in the usual type of Chinese houses in the Colony (including even good ones) is dark, rickety and very steep, in fact, absolutely dangerous: knowing them as I do, the wonder has been, more accidents have not occurred. I have on several occasions endeavoured to get a clause inserted in the Building Ordinances limiting the height and tread of steps in Chinese Dwellings as is done in the Building Bye-laws of Municipal Towns in England and other places. Ground in this City is valuable, in the future it will become more so, the tendency will be to increase the height of new buildings, which means also the making of the staircases much steeper than they are now, and consequently more dangerous, as is now the case in nearly all 4-storied houses. The steps in the suggested new type of house, would be 12 inches wide and 6 inches rise. In some Chinese good houses, the tread is only $5\frac{1}{2}$ inches and height 9 inches. It requires practice, and a cool head, to descend a long flight of say 4 stories of such steps, especially when there is only a rope to hang-on too, or an apology for a hand rail. I had occasion some time ago, to show the late Mr. S. Brown (Surveyor General) such a staircase, and it was only with the greatest difficulty we got him down safely. A recommendation from your Committee on this matter would probably be the means of a clause on the lines now suggested, being introduced into any new or amended Building Ordinance. The *minimum* tread of steps in any house used for human habitation should be 8 inches and the maximum rise of the step $8\frac{1}{2}$ inches.

13. It will be noticed that each habitable room is *unusually* well lighted and ventilated, most of the rooms on each floor having large doors and windows on *three* sides, and the others on two sides, none of them having any obstructions of any kind. These would give the respective rooms an *extraordinary* amount of light and ventilation in every direction, and it is a well known fact, that the more light and ventilation you have (even in Chinese houses) in rooms, especially such as are now referred to (which would be both *living* and *sleeping* rooms), the cleaner and sweeter they would be kept by the occupants, in addition to which, they would be more conducive to the improved health and general tone of the people living therein. Each room opens *direct* on to the 6-foot verandah, which would be for all practical purposes, an extension of the respective rooms abutting on to it.

It is also proposed to have iron balconies, 4 feet wide, on the first and second floors of such blocks as have a frontage to the *50 feet* wide public streets.

14. If it would be thought desirable (of which I have no doubt in my own opinion) I have provided for Ablution Rooms on the first and second floors, as it cannot but be thought objectionable, that men, women, and children should have no alternative but to perform these necessary duties, either in the cook-house (which is required and *used* for other purposes) or in the presence of their fellow lodgers.

If we wish to encourage and promote clean habits and a more sanitary mode of living among the working and coolie class of Chinese residents in the Colony, let us, before condemning them for their dirty habits, give them the means of becoming clean and improving their objectionable mode of living, &c., &c.

15. The floors of all the ground floor rooms, would be of concrete, and the walls (external and internal) rendered for a height of 18 inches in neat cement.

16. The only underground drain in the Block, would be the one leading from the large gully, in the centre of the open yard. It would be laid in a straight line to the 20-feet private street, passing *under* the floor of the latrine, it would be of 6 inches diameter glazed earthenware socket pipes, pointed in cement, and bedded in concrete, having man-holes at each end for inspection and cleaning purposes.

17. Water would be laid into each cook-house and ablution-room, and a small stand-pipe, in the open yard for general purposes, which stand-pipe would also be used by the tenants generally (having a large enclosed open yard) for washing their clothes, &c., which would be done in the usual Chinese manner, a little soap and small wooden tub. If no provision of this kind is made, they have no alternative but to resort to the side-walks of the public streets as is now the case.

18. The living rooms vary somewhat in size, they are so designed, however, that they could be easily let out to friends, clansmen, or married families, who may wish to live together.

19. Such a Block, as the one referred to on Drawing No. 2, Block A on Inland Lot No. 954, would accommodate 371 adults, allowing each adult 300 cubic feet and 21 superficial feet. The estimated cost of such a building (exclusive of the cost of the ground) is about \$8,500.00 or, say, at the rate of \$23.50 per adult.

20. Twenty-seven (27) Blocks of houses as described, can be erected on the three plots of ground referred to, viz.:—

	<i>No. of Blocks.</i>	<i>No. of Adults.</i>
Inland Lot No. 953,	11	3,635
„ „ 954,	6	2,226
„ „ 906,	10	3,510
Total,	<u>27</u>	<u>9,371</u>

or at the rate of 2,136 adults per acre. The *net* actual building area of the three plots of ground is 419 acres.

21. I should like here to caution the Committee against being lead away by misstatements as to what is overcrowding. A letter by a well known Medical Gentleman (Dr. CANTLIE) appeared in the local papers a few days ago, in which he said: "In Britain 1,000 persons to an acre is the sanitary limit,* any number over that constitutes surface overcrowding as distinct from overcrowding," this statement is very vague and likely to do harm, and, in my opinion, no importance whatsoever should be attached to it, unless the writer of the letter gives us his authority for the statement, and how his figures were arrived at. Was the acre area mentioned the *net* actual area covered by buildings, or did it include streets, gardens, yards, parks, commons, &c., extending over many acres? The before mentioned number of people that can be accommodated in the suggested new buildings, and allowing each individual 300 cubic feet, and also in a 3 storied building only, is at the rate of 2,136 adults per acre, and I am sure that the learned Doctor himself would, or could not, by any possible means call it "overcrowding."

* Query.—W.J.S.

22. Some building owners and others may possibly think that the type of house, sketched out herein, is too good, and too expensive for the poorer classes of Chinese; if they go thoroughly into the question, however, I feel sure that they cannot but think \$23.50 per adult is a very reasonable, if not cheap rate, for such a class of house as now proposed, and it will bear favourable comparison with the cost of the ordinary low, ill ventilated, ill lighted, dark and dirty type of existing Chinese houses, especially when consideration is given to the superior accommodation provided in the new houses, in the matter of open yard, light, air, latrines, ablution rooms, good cook houses, verandahs and a good, safe, and well lighted general staircase. The occupants can secure more privacy, the sexes and married people can easily be kept separate, and in a much better manner than in the existing houses. The concierge, living as he would be, in the Entrance Lobby would have a greater control over the inmates in every respect, he would be able to prevent tenants leaving without paying their rent, or removing their belongings unknown to the landlord. He would be able to supervise the general cleanliness and sanitary condition of the premises, and be in fact, the residential agent of the owner.

23. It is generally understood that new, or amended Building Regulations are about to be introduced. This is an unusually favourable opportunity for the Government to take a new departure in the matter of the erection of healthy houses for the poorer classes of Chinese, it would be a measure in which the Government would have the support of the whole of the community. I have, therefore, ventured to address your Committee on the subject, being one in which I have always taken a great interest, and the importance of which has been forced on the attention of the Government and community lately in a very strong and emphatic manner.

24. With a view, therefore, of furthering this project, I would very respectfully suggest that the Government be asked to erect one or more Blocks of houses such as are referred to herein, as an experiment. I feel sure, however, from my experience on the subject, that with proper management they will always be sought after and that the Government (or owner) will always command good tenants, and will eventually be able to dispose of the property at a reasonable profit.

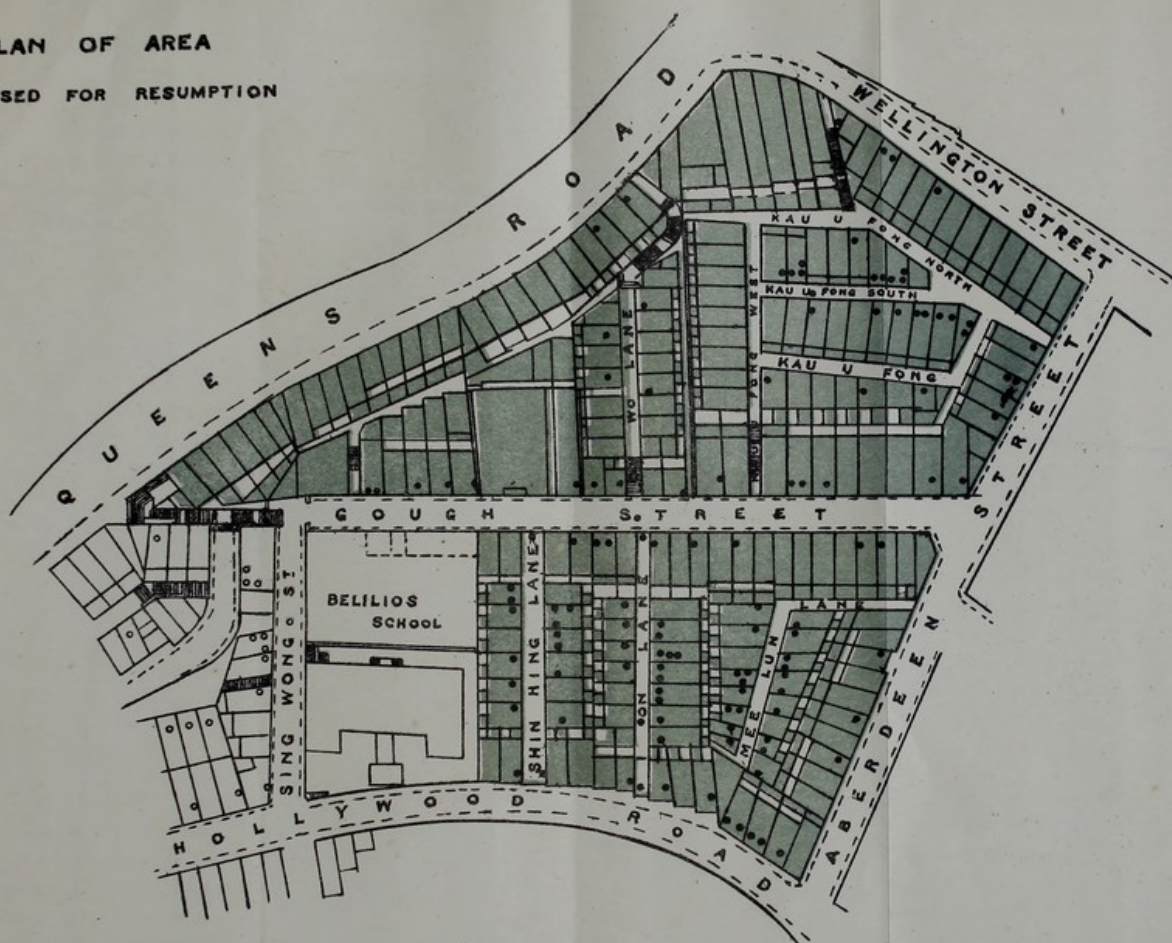
25. This locality (viz., the west end of the City) is a far more popular district with the Chinese, than the east end, viz., Causeway Bay: they will not go so far east, especially when the bulk of the Chinese hongs and shipping offices are in the central and western portions of the City; this City is like most of the large towns and cities of Europe and America, which have almost invariably extended (and are still extending) *westwards* (this applies both to ancient and modern cities) the reasons for which, although so universal, has never, in all cases, been satisfactorily explained.

26. I have not gone into the question of the cost of the ground, comprising Inland Lots Nos. 953, 954 and 906, as I understand information on this subject has already been laid before you.

Yours truly,

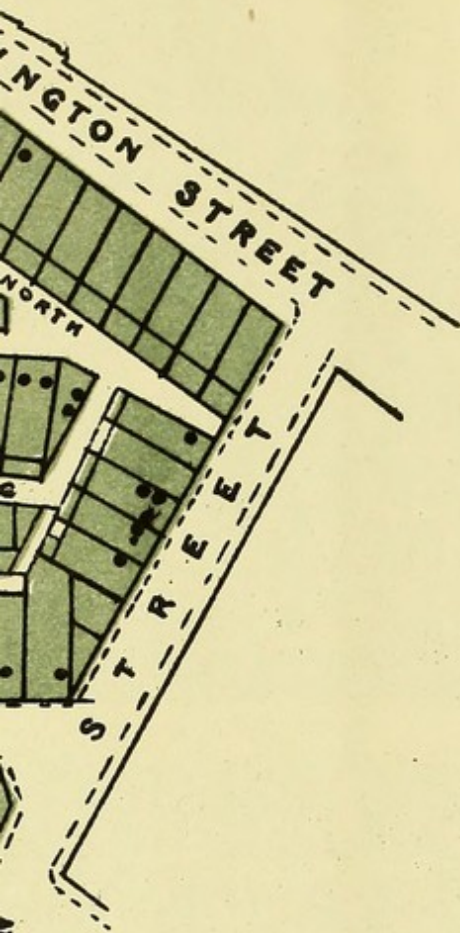
WM. DANBY, M. INST. C.E.

PLAN OF AREA
PROPOSED FOR RESUMPTION

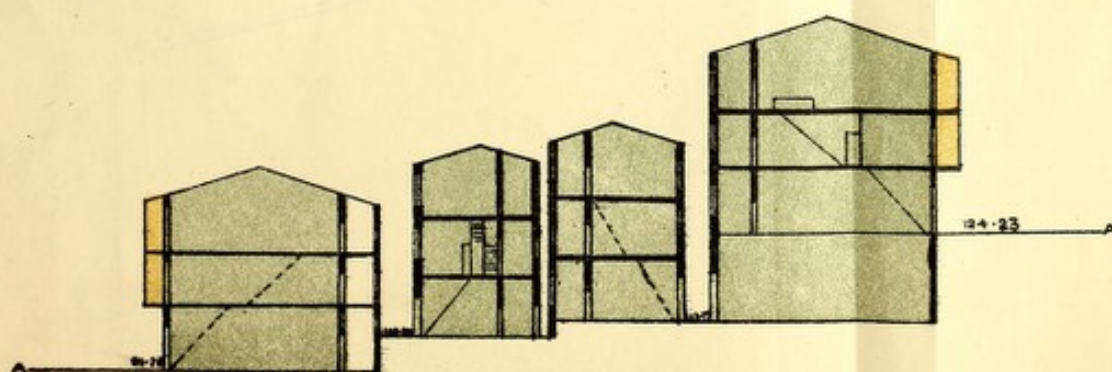
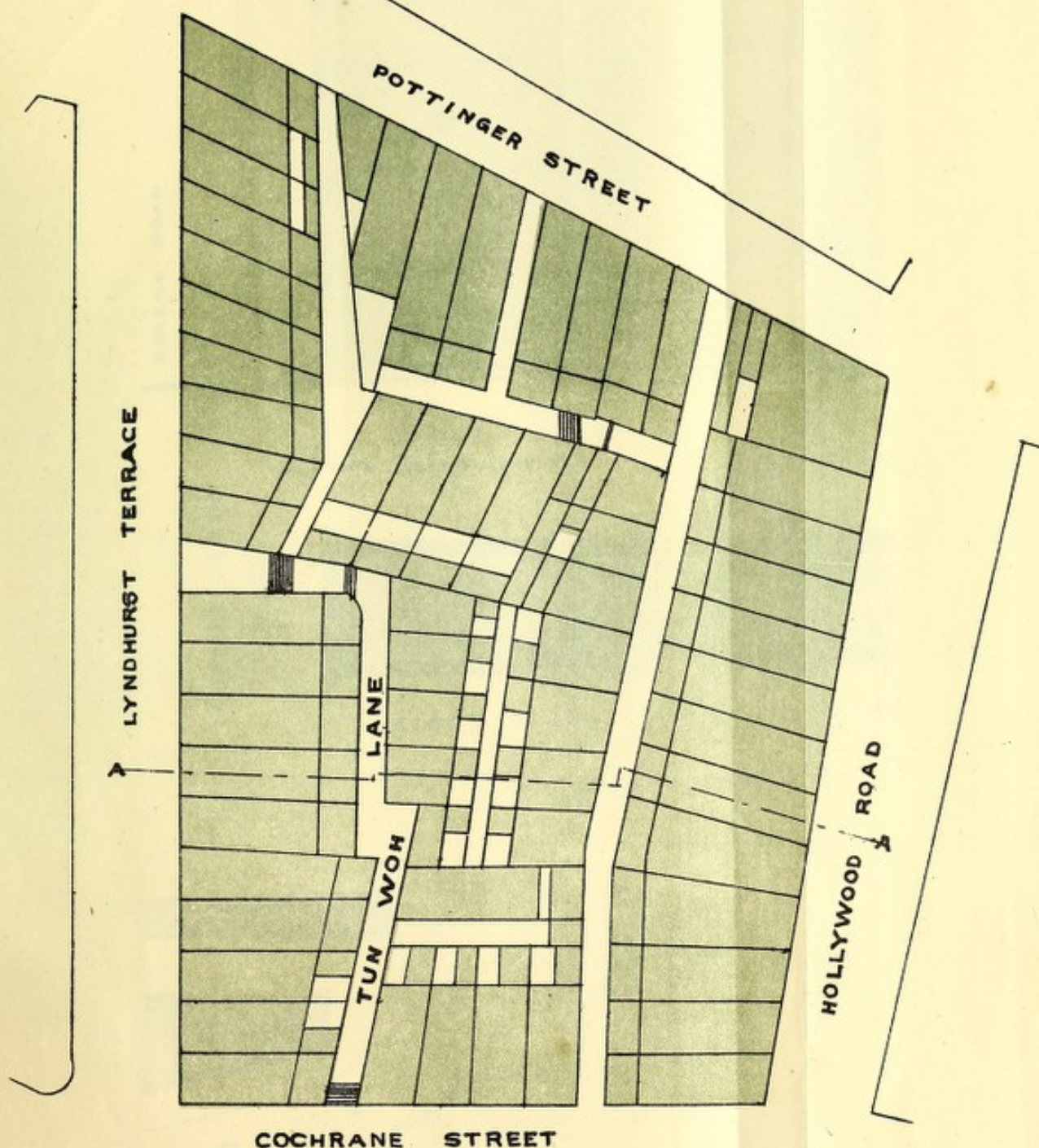


Scale 1 inch = 100 Feet

PLATE I.



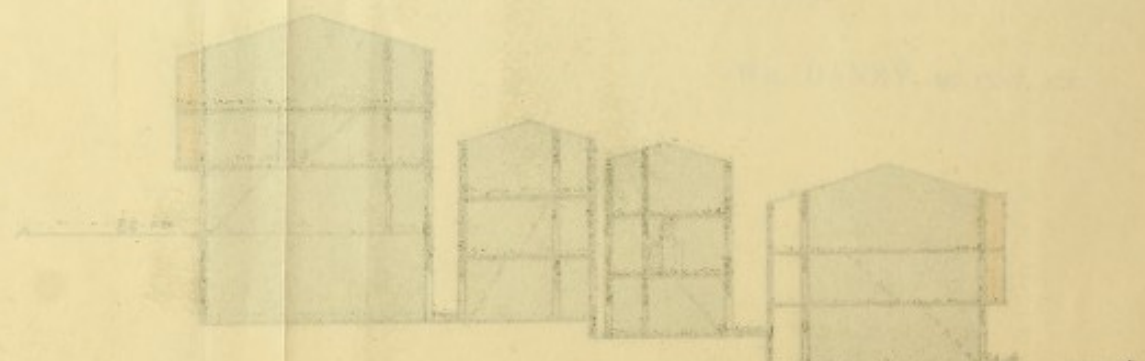
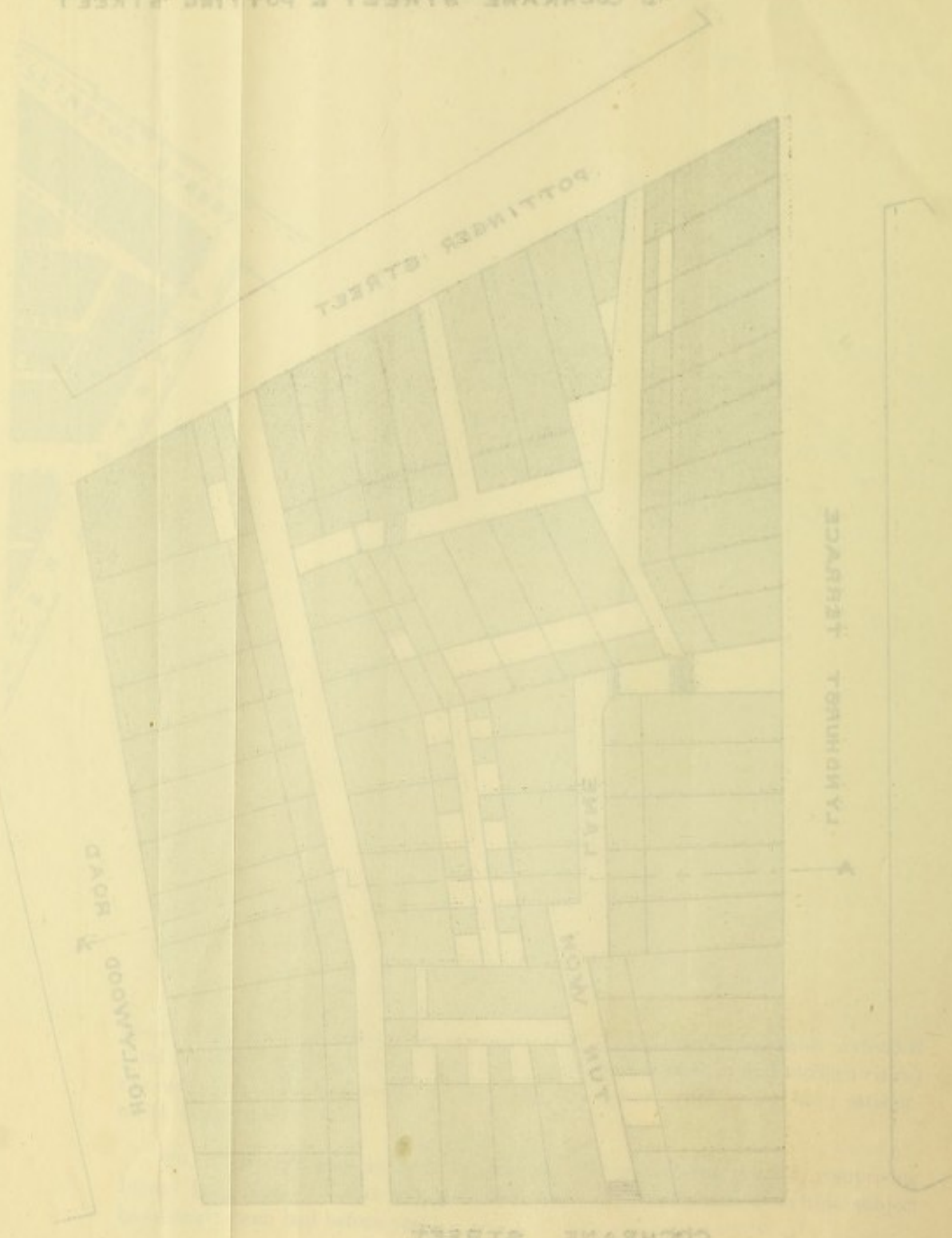
SECTION & GROUND PLAN OF BUILDINGS
BETWEEN HOLLYWOOD ROAD & LYNTHURST TERRACE
& COCHRANE STREET & POTTINGER STREET



SECTION A.A.

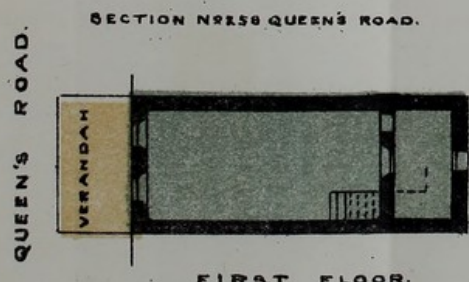
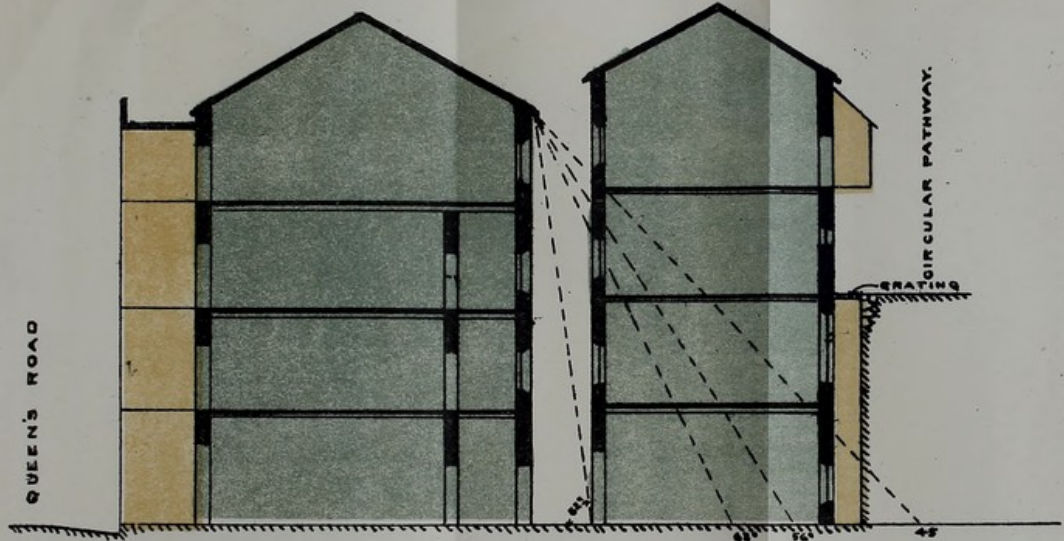
SCALE 1 in = 40 ft

SECTION & GROUND PLAN OF BUILDINGS
BETWEEN HOLLYWOOD ROAD & LYNDHURST TERRACE
AT COCHRANE STREET & POTTINGER STREET

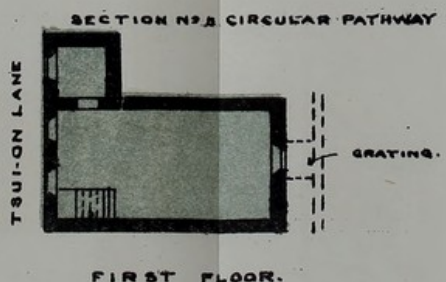


SECTION BETWEEN QUEEN'S ROAD AND CIRCULAR PATHWAY ACROSS TSUI-ON LANE

PLATE III.

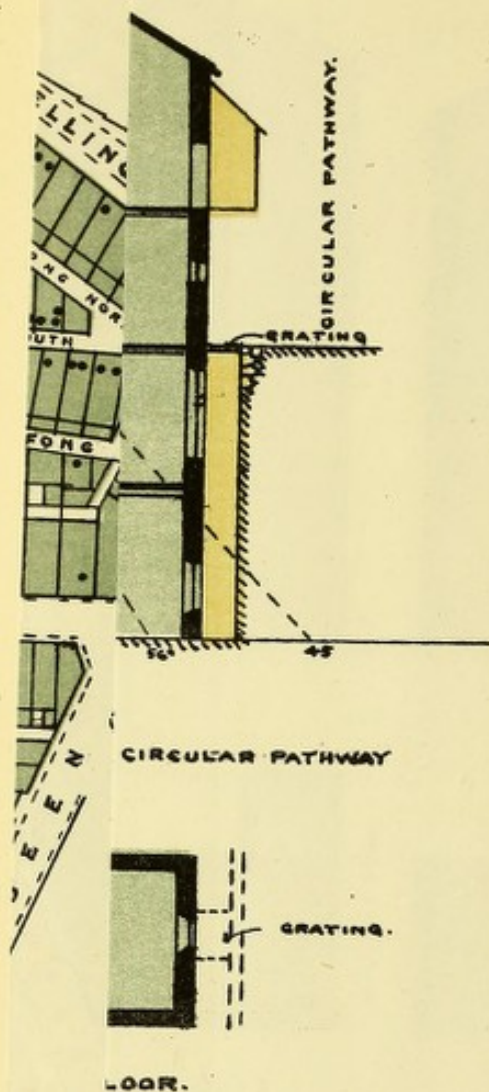


FIRST FLOOR.



FIRST FLOOR.

SCALE 1 IN = 20 FEET

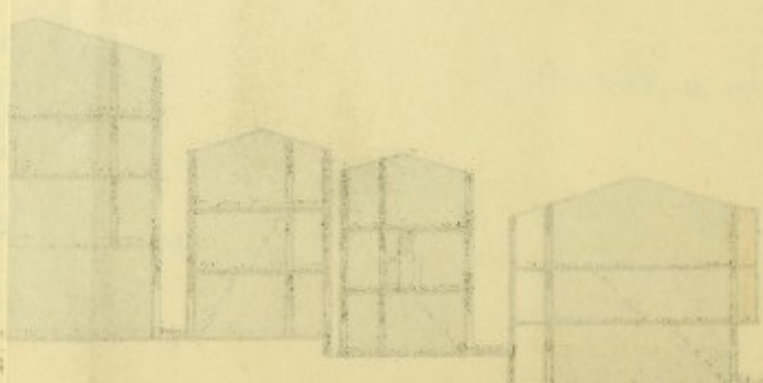


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26. I l
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COCHRANE STREET



SECTION A-A

PLAN INLAND LOTS 799 & 818.
Scale 1 inch = 40 Feet.

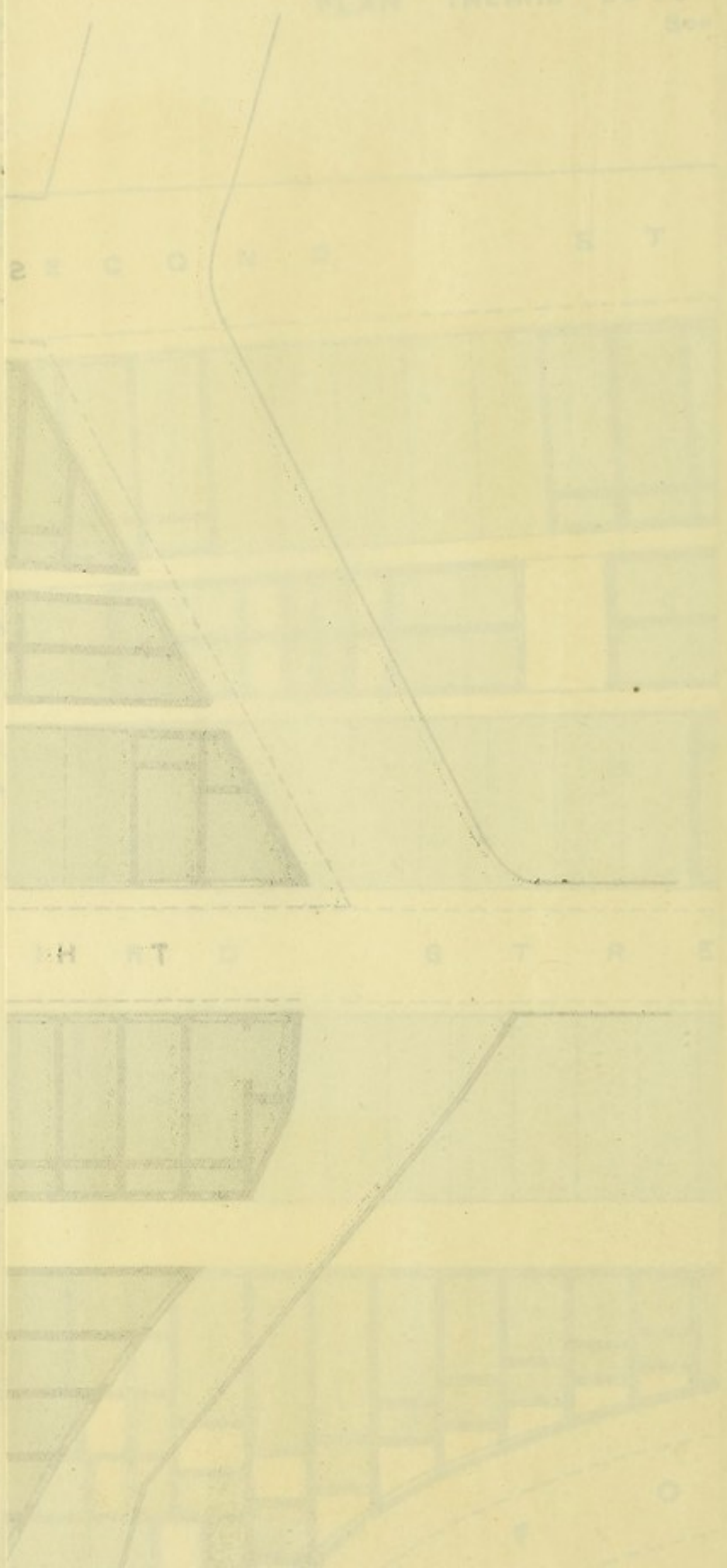


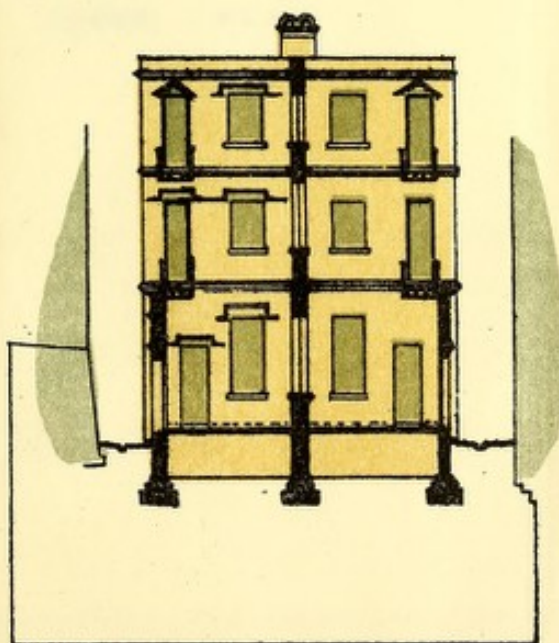
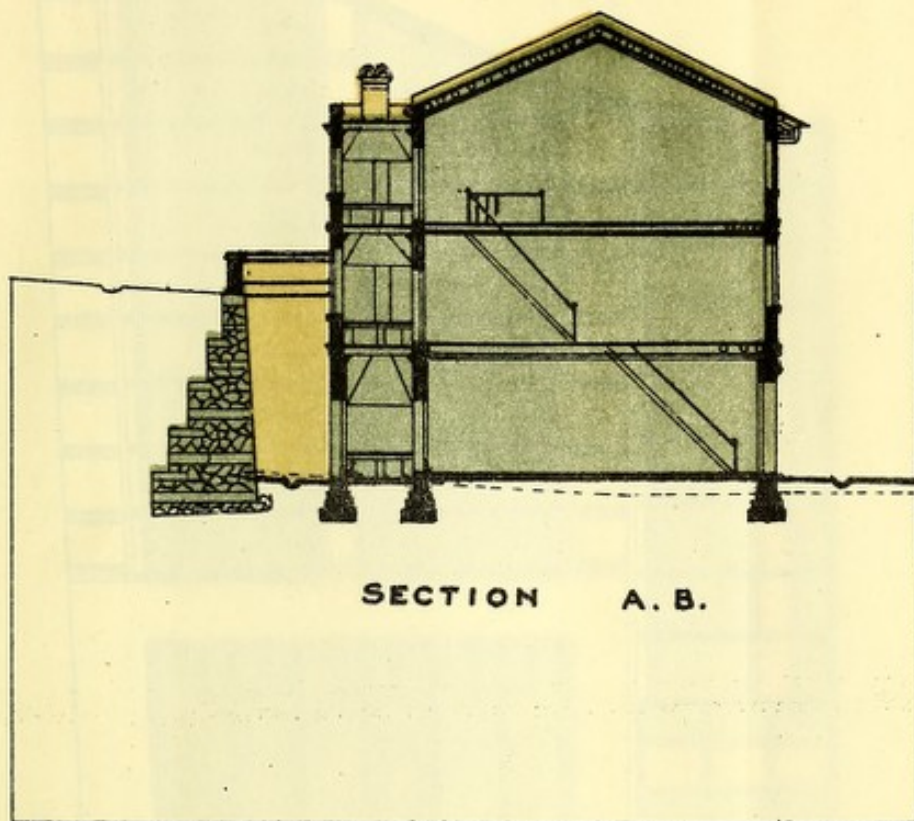
PLAN INLAND LOTS

Sec

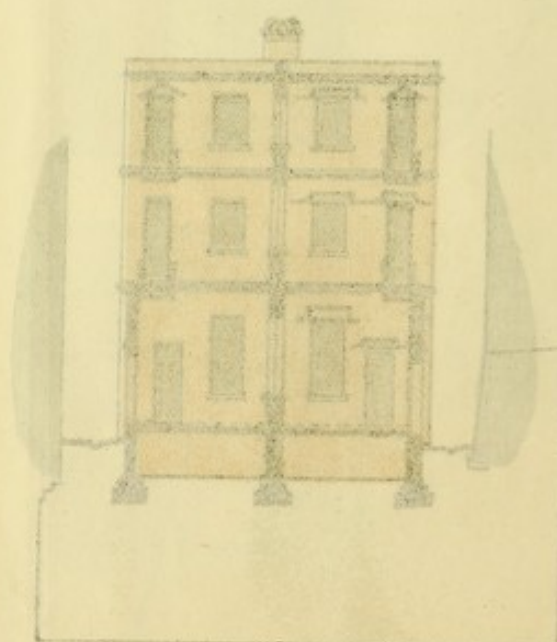
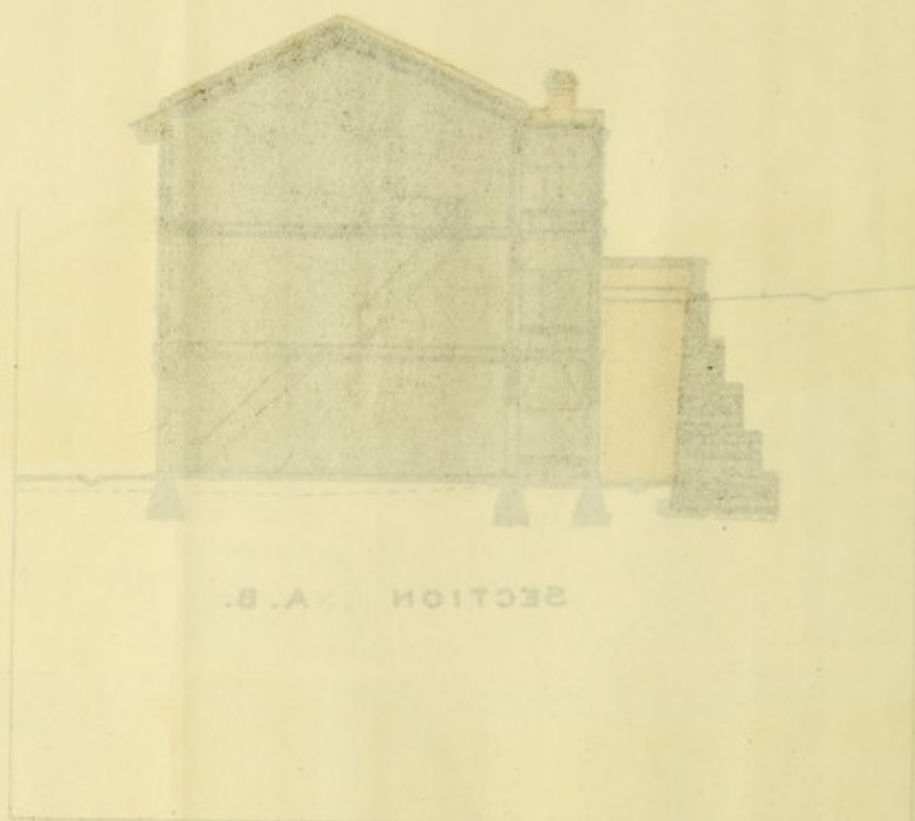
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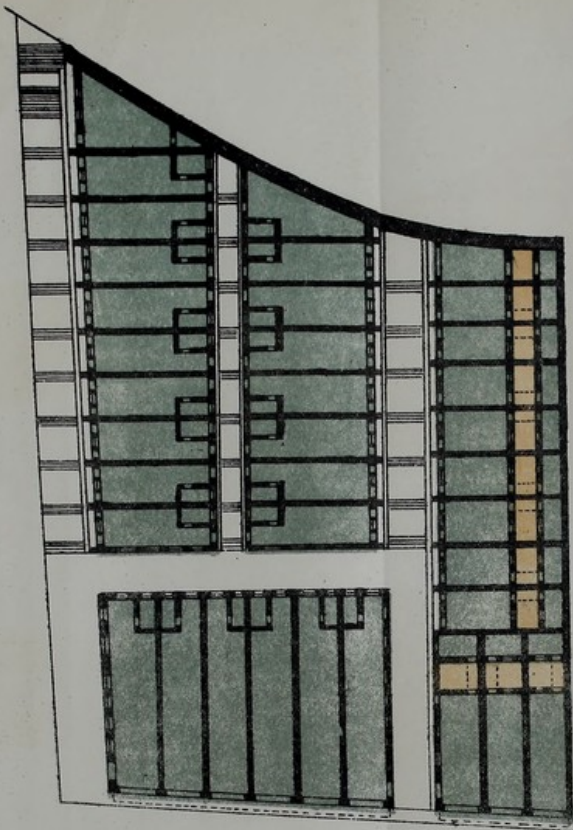
Scale 1 inch = 20 Feet



SECTION C.D.
Scale 1 inch = 20 feet

HOUSES ON I. L. 797
 SEC. A.
 Scale 1 inch = 40 Feet.

PLATE VII



BLOCK PLAN



ELEVATION TO EAST PASSAGE



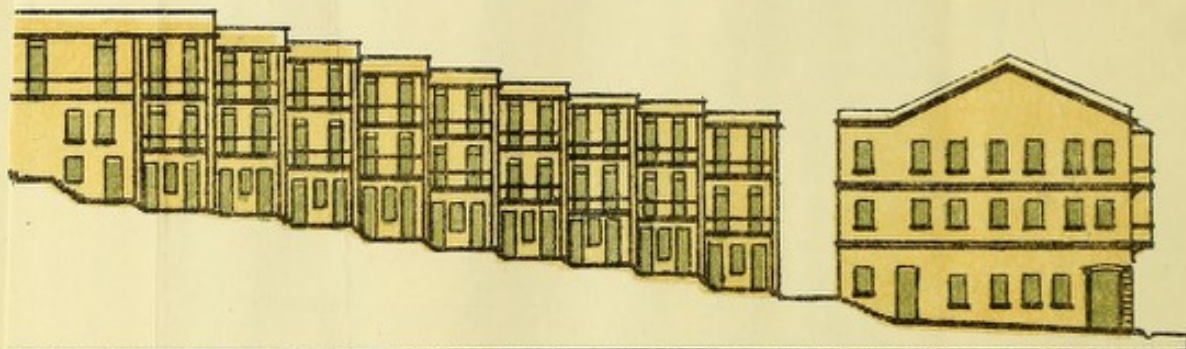
ELEVATION TO WEST PASSAGE

HOUSES ON I. L. 797

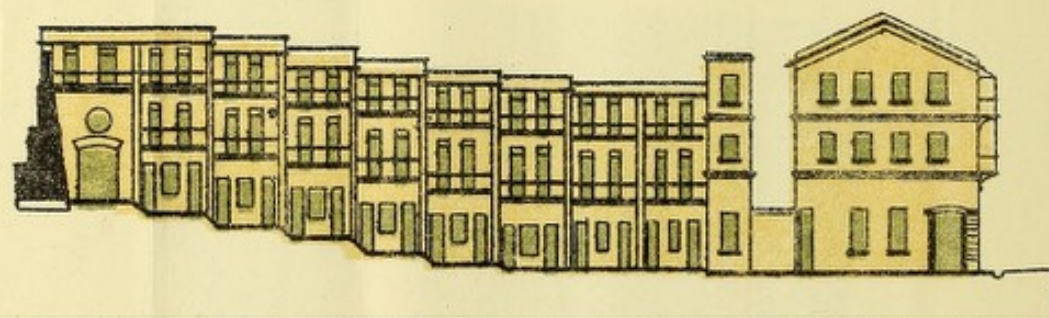
PLATE VII

SEC. A.

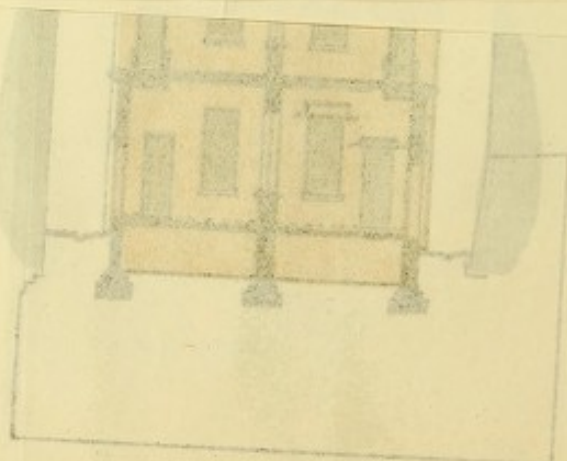
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ELEVATION TO EAST PASSAGE



ELEVATION TO WEST PASSAGE

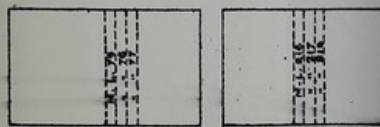
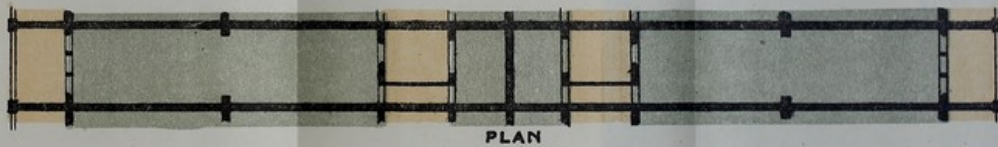
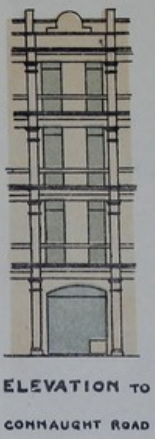
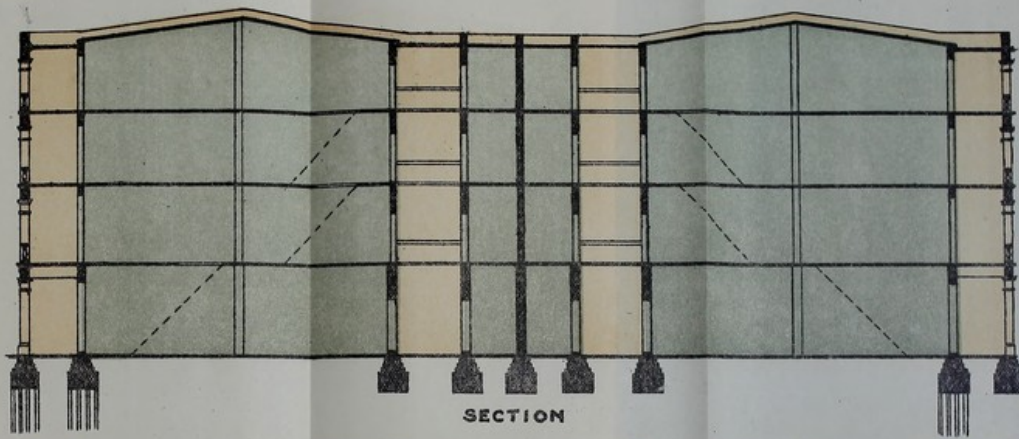
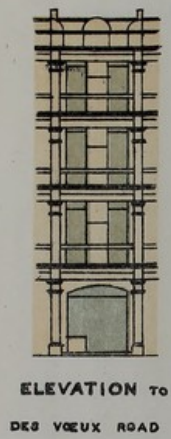


SECTION B. B.

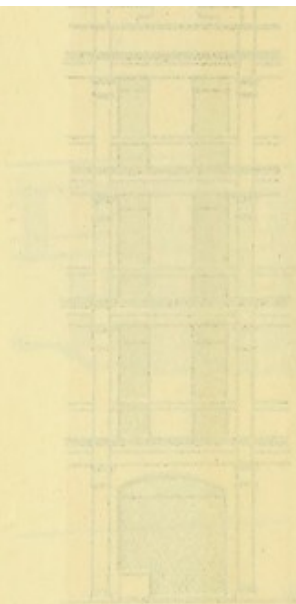
Scale 1 inch = 40 Feet.

HOUSES ON M. L^s 76 & 217.
Scale 1 inch = 20 Feet.

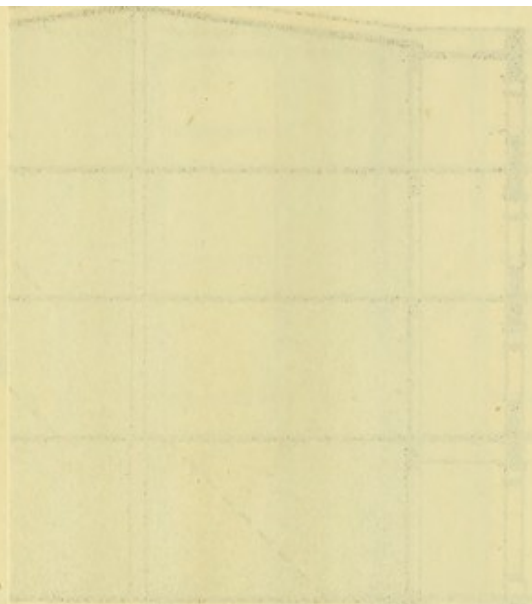
PLATE VII.



Scale 1 inch = 160 Feet.



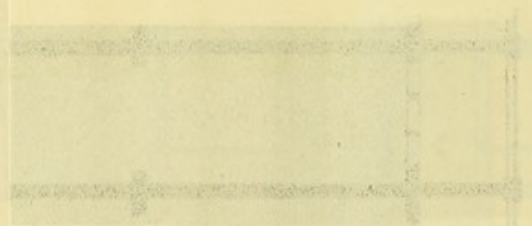
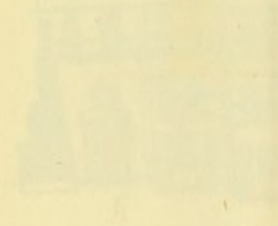
ELEVATION TO
CONDUIT ROAD



SECTION



ELEVATION TO
DEE WICK ROAD

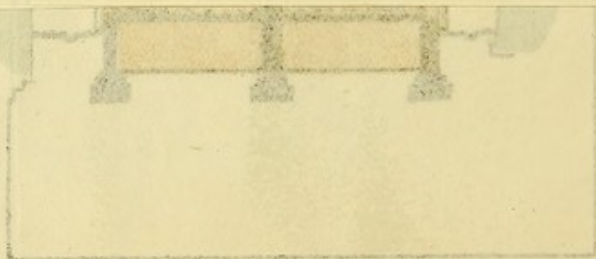


PLAN



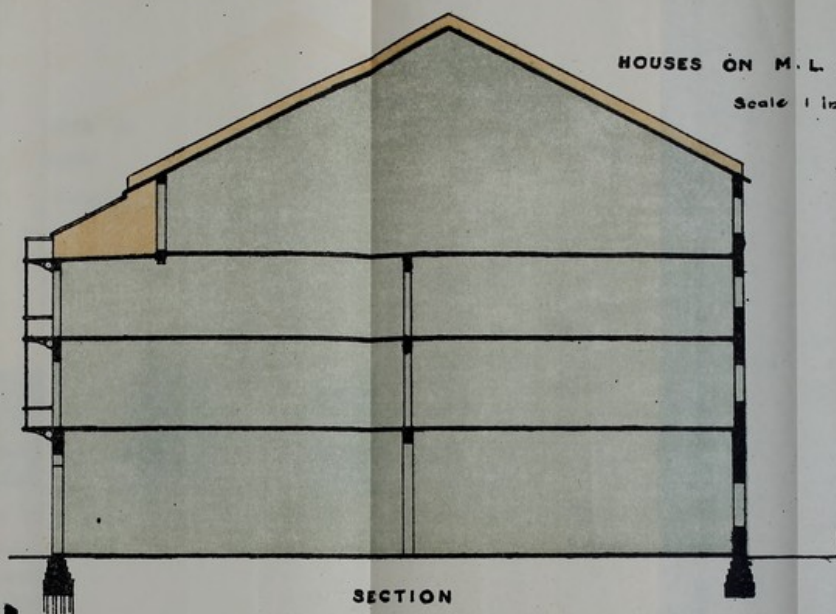
BLOCK PLAN

Scale: 1/4" = 1'-0"

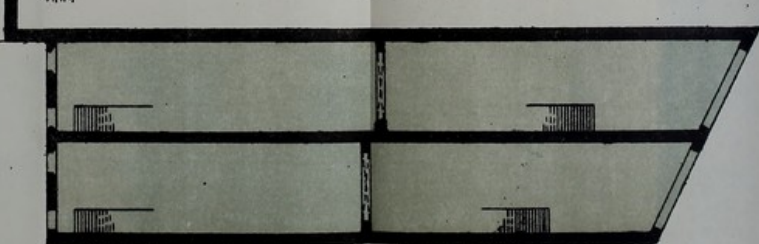


HOUSES ON M. L. 225.

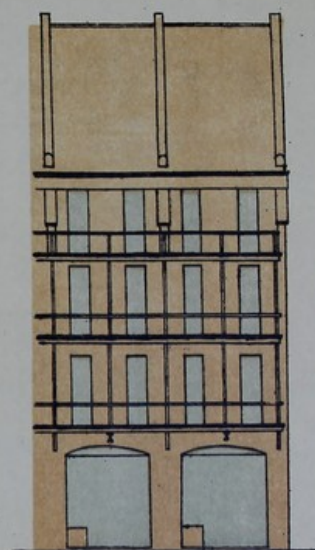
Scale 1 inch = 16 Feet.



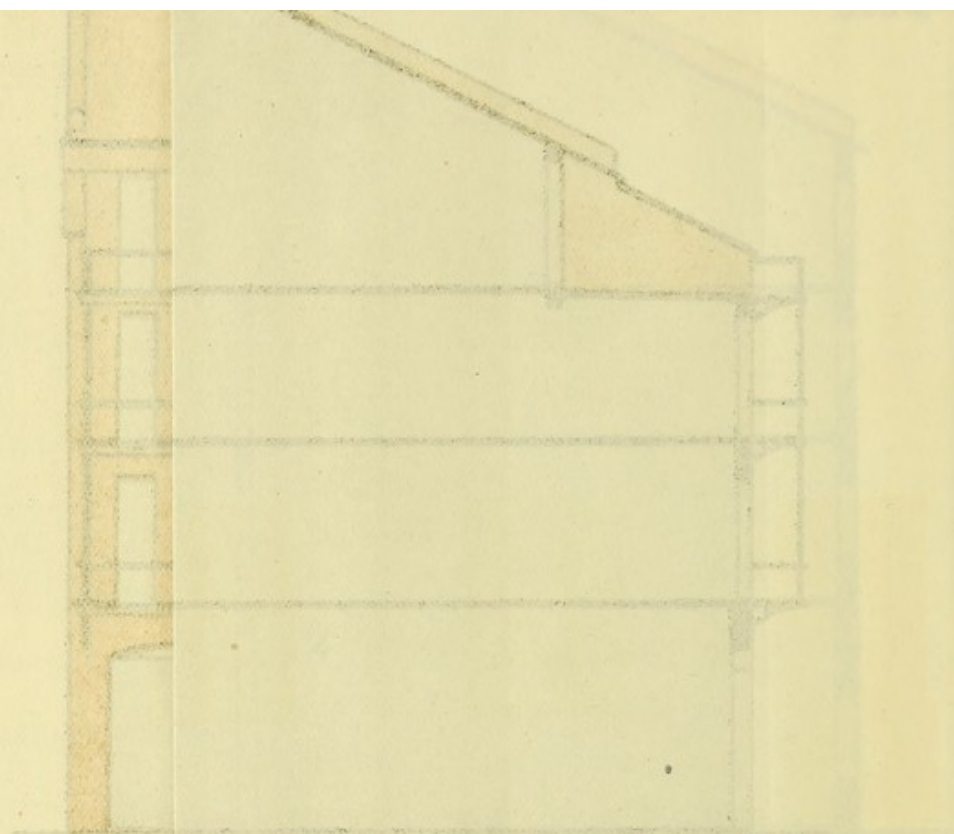
SECTION



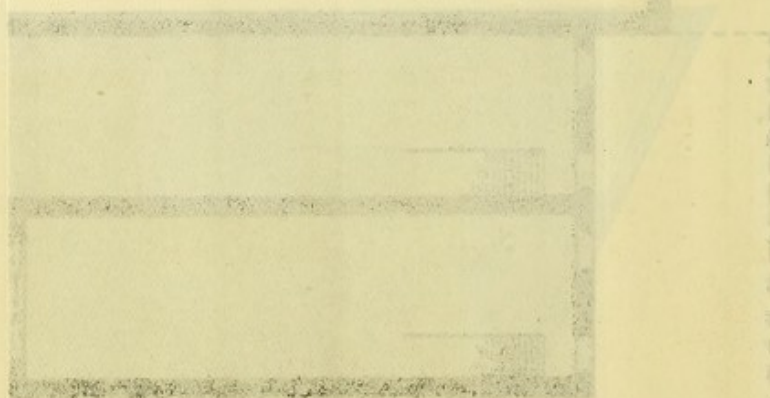
PLAN



ELEVATION



SECTION
N

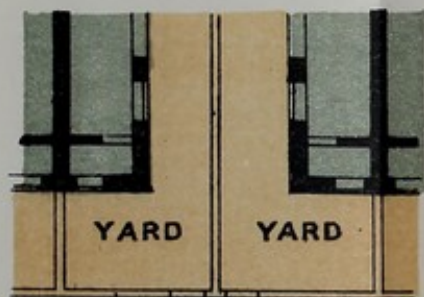


19

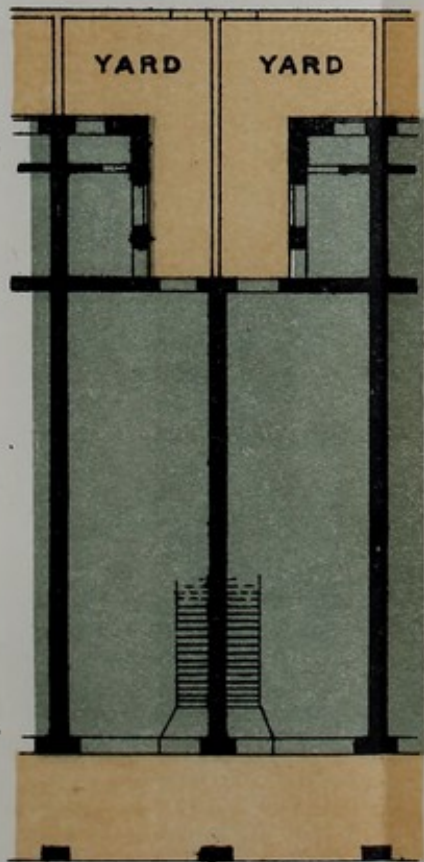
PLAN SHOWING YARDS
& SCAVENGING LANE IN
COMMUNICATION

PLATE IX

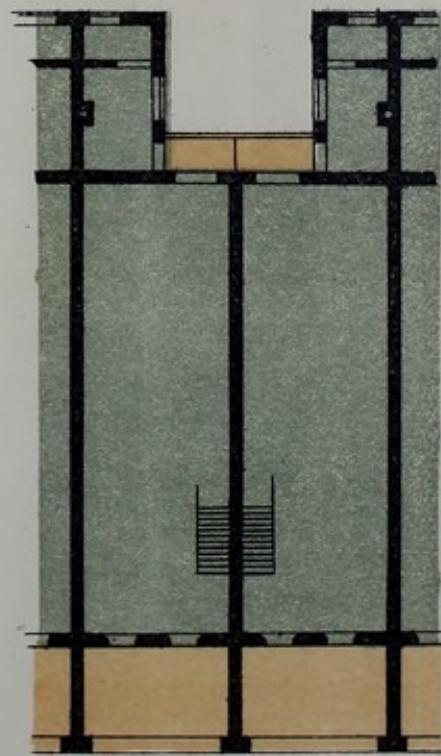
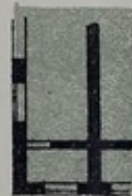
Scale 1 inch = 16 Feet



SCAVENGING LANE



GROUND FLOOR

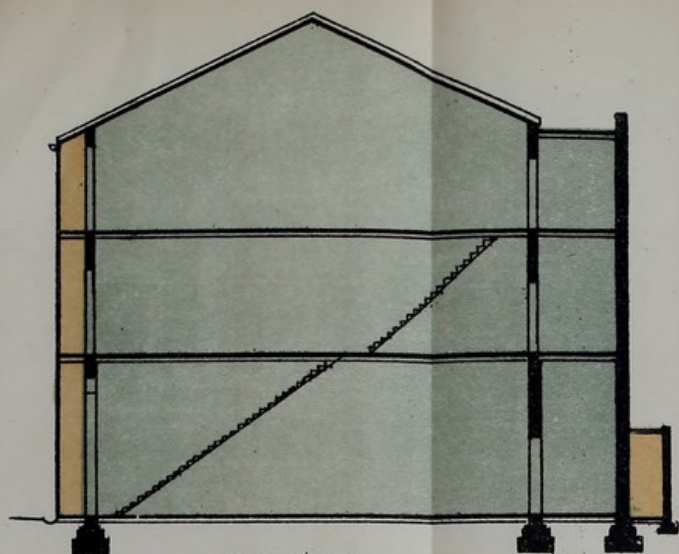


UPPER FLOOR

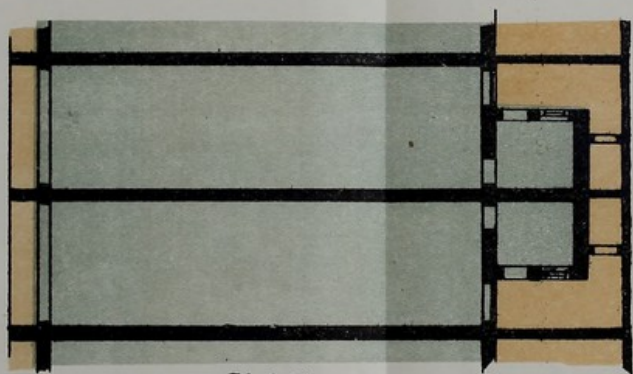
PLATE X.

HUNGHOM I. L. 222 & 223

Scale 1 inch = 16 Feet.

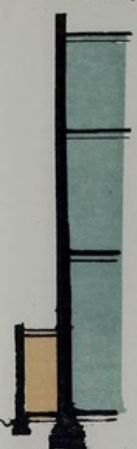


SECTION

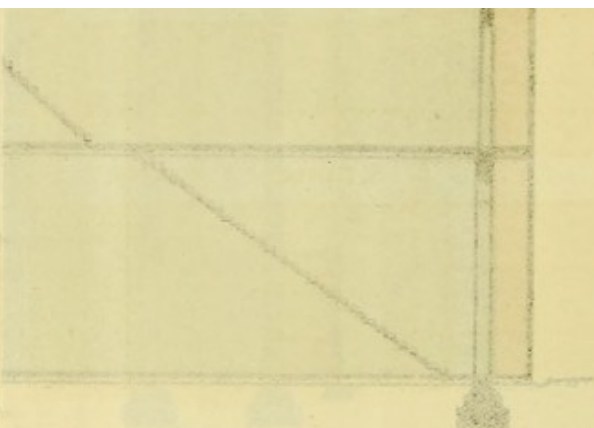
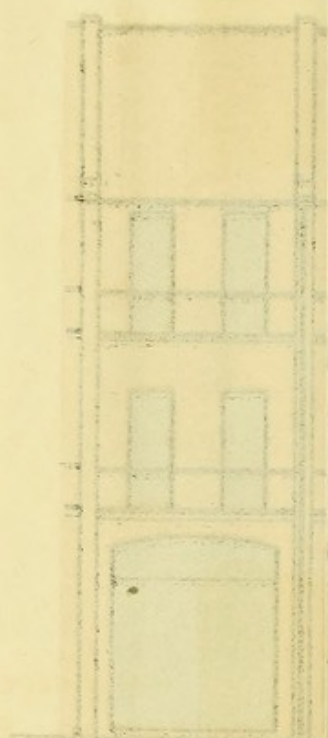


PLAN

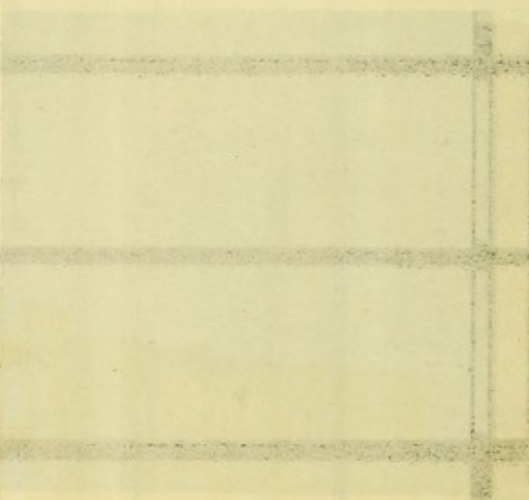
15 Feet Lane



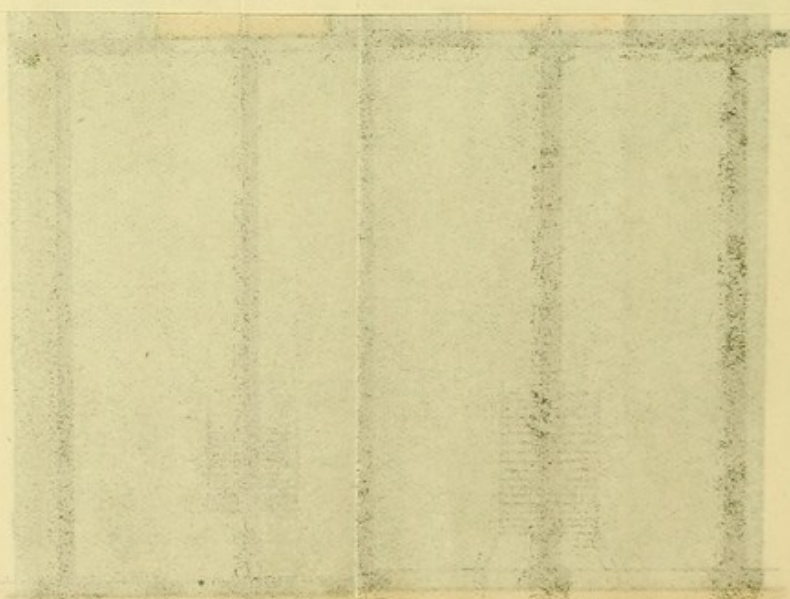
ELEVATION



SECTION

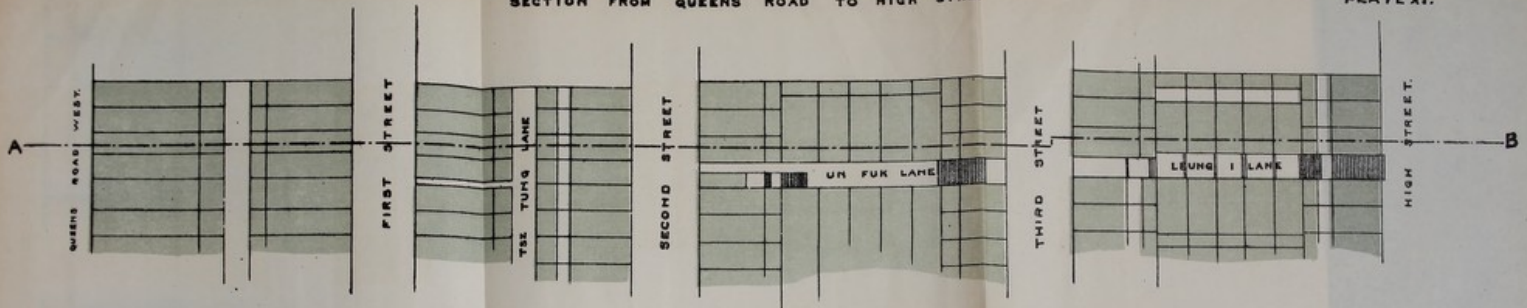


PLAN

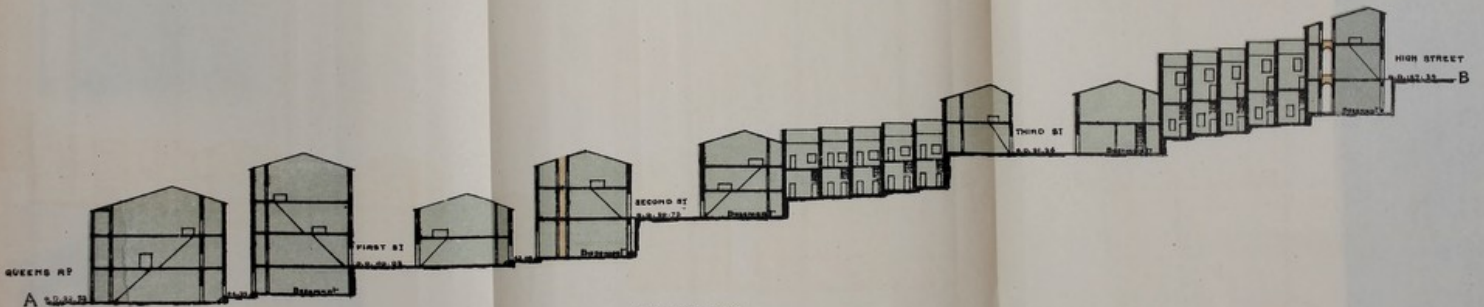


SECTION FROM QUEENS ROAD TO HIGH STREET

PLATE XI.

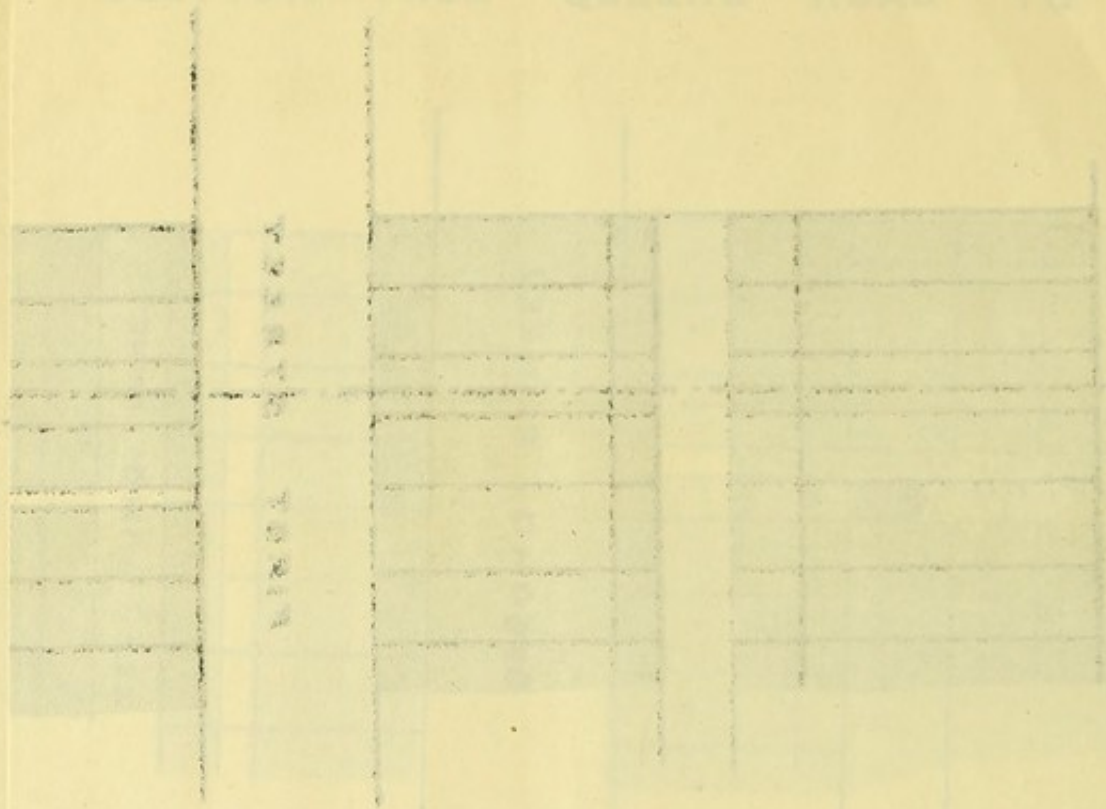


SITE PLAN

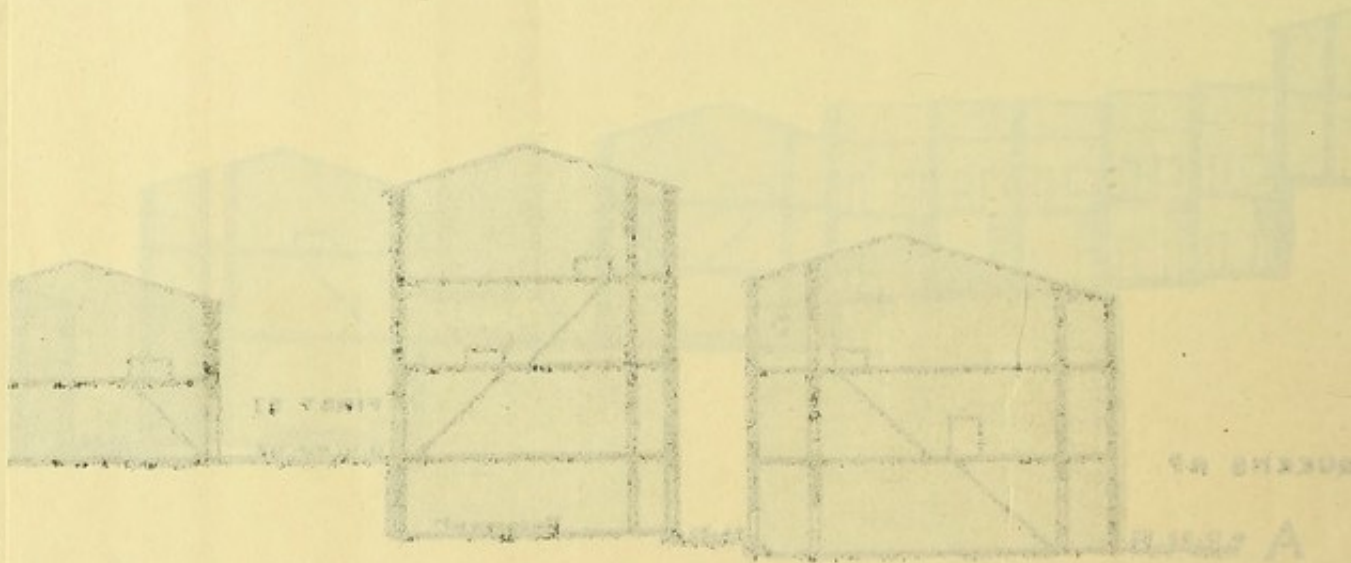


SECTION
Scale 1 inch = 40 Feet

8



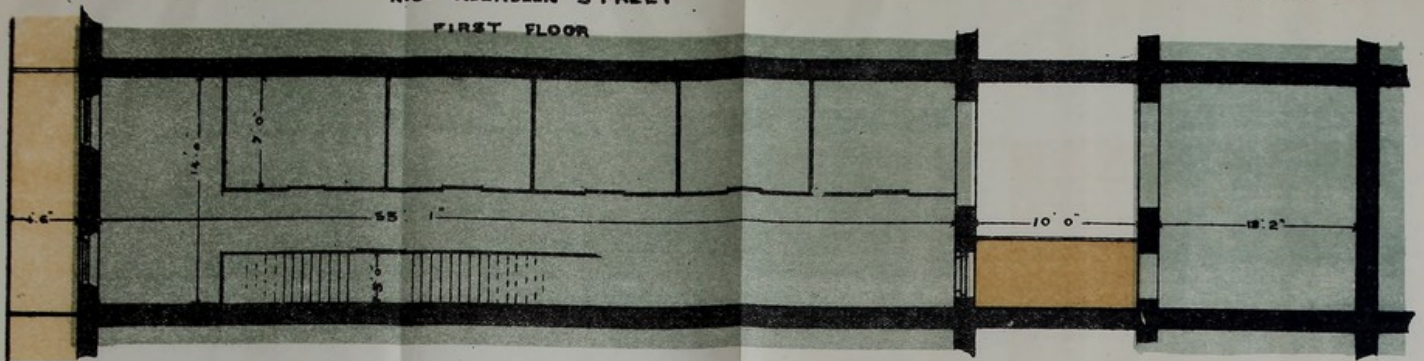
SITE PLAN



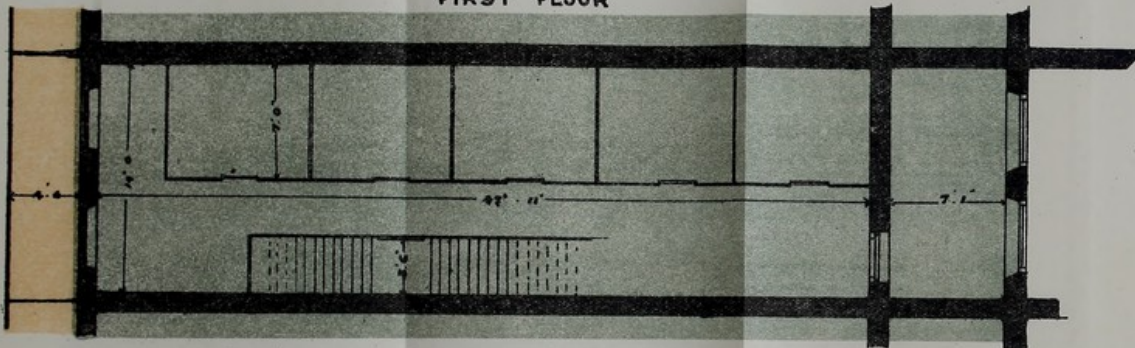
SECTION
Scale 1 inch = 40 Feet

№30 ABERDEEN STREET
FIRST FLOOR

PLATE XII



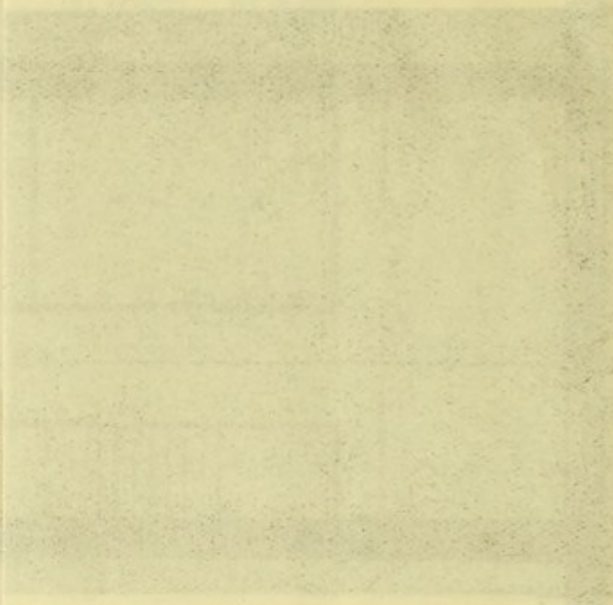
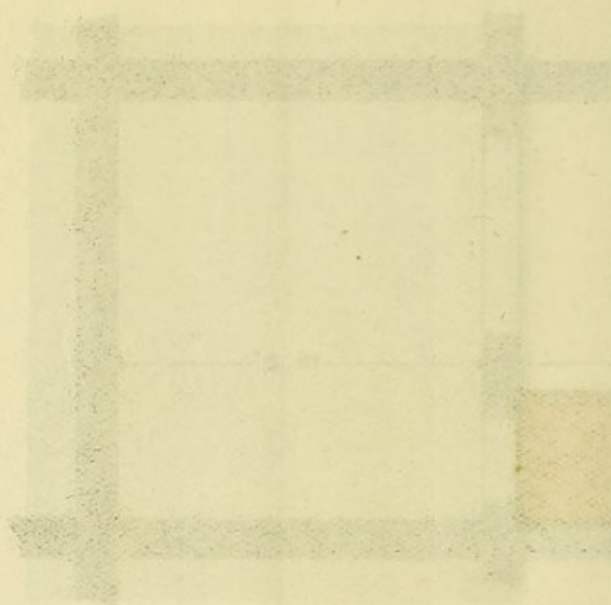
№16 SQUARE STREET
FIRST FLOOR



SCALE 1 IN = 8 FT

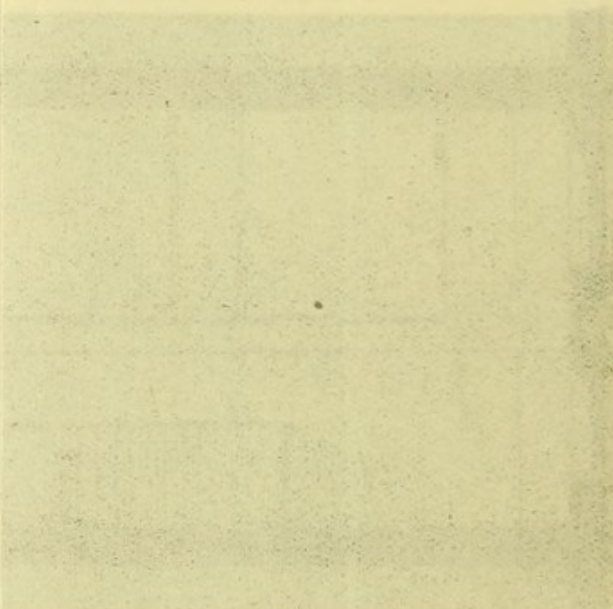
PLATE XII

THE TEMPLE OF VENUS



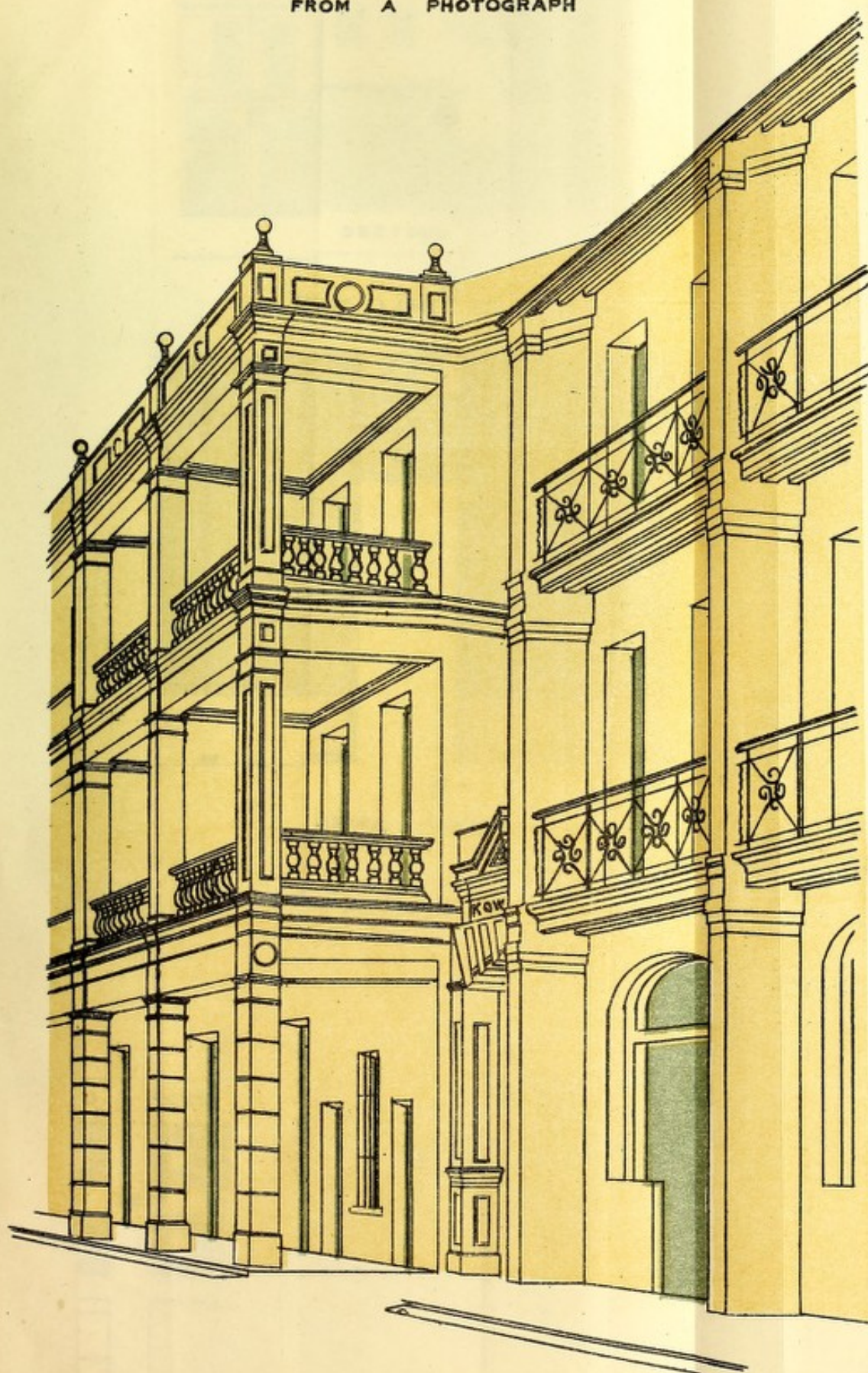
THE TEMPLE OF VENUS

THE TEMPLE OF VENUS



THE TEMPLE OF VENUS

TYPICAL BALCONIES TO CHINESE HOUSES
FROM A PHOTOGRAPH

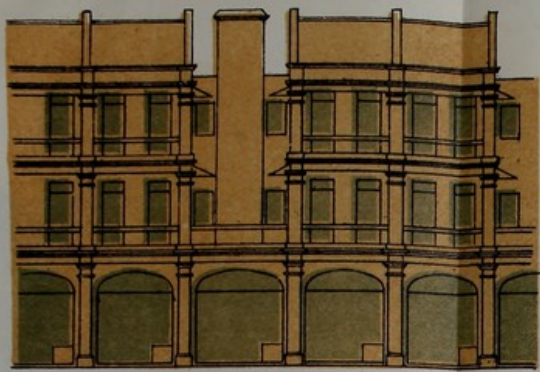


TYPICAL BALCONIES TO CHINESE HOUSES
FROM A PHOTOGRAPH



IMPROVED TYPE OF CHINESE HOUSES
MR CHATHAM'S DESIGN
Scale 1 inch = 20 Feet

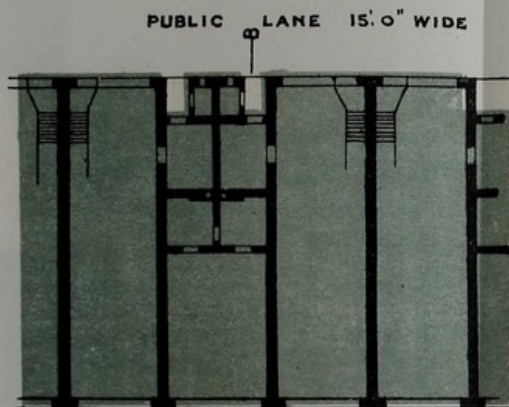
PLATE XIV.



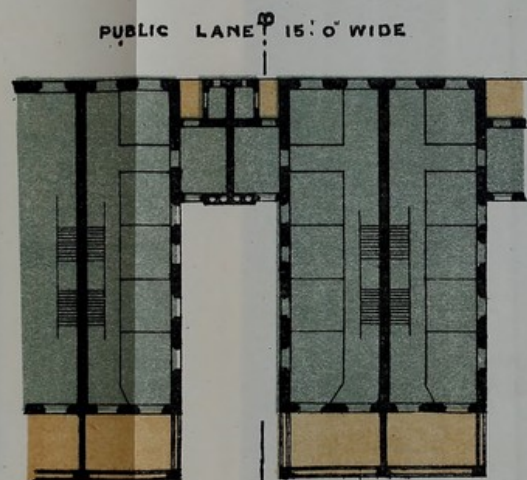
ELEVATION



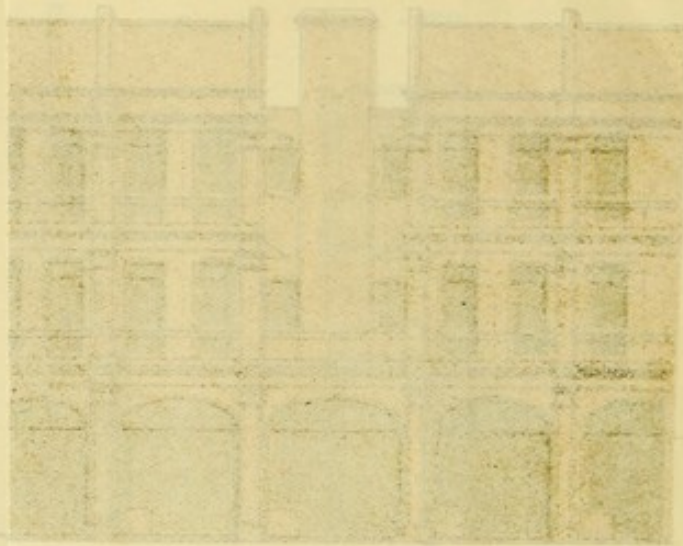
SECTION B. B.



GROUND FLOOR

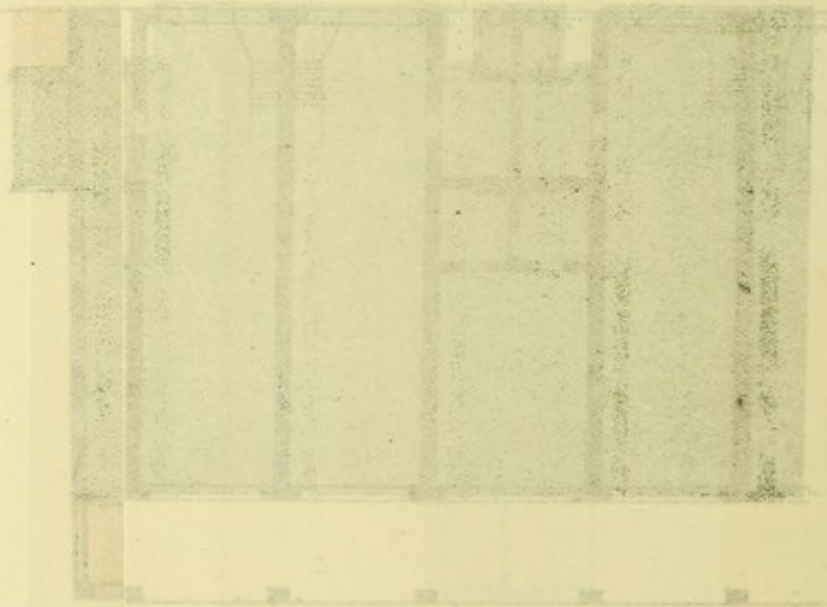


UPPER FLOORS



ELEVATION

PUBLIC LAKE 15' 0" WIDE



GROUND FLOOR

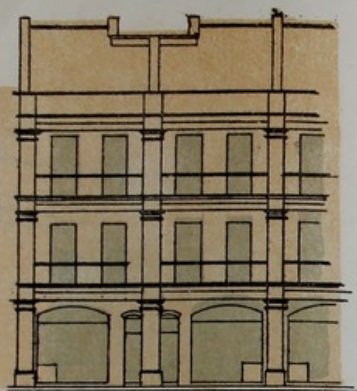


IMPROVED STYLE OF CHINESE HOUSES

Scale 1. inch = 20 Feet

MESSRS PALMER & TURNER'S DESIGN

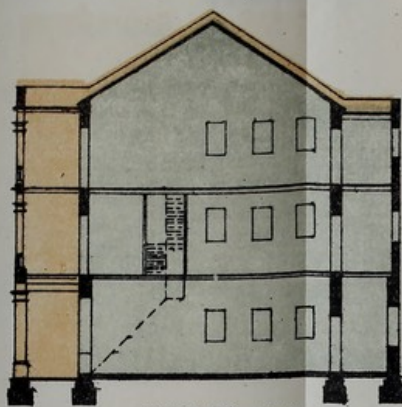
PLATE XVI.



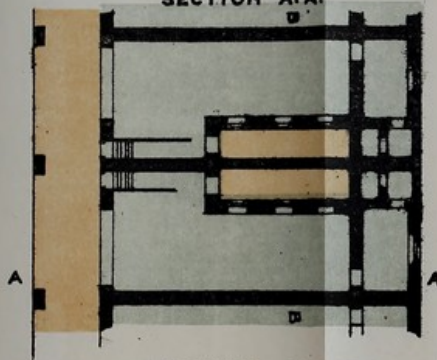
FRONT ELEVATION



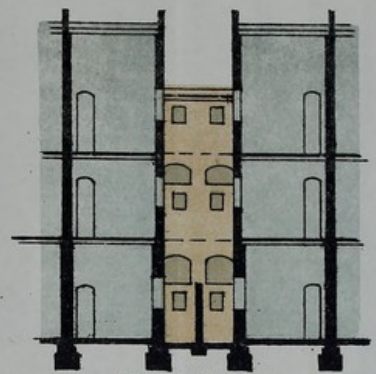
BACK ELEVATION



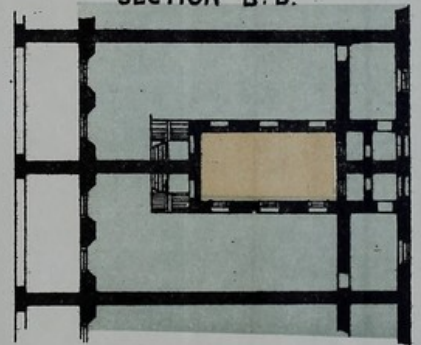
SECTION A.A.



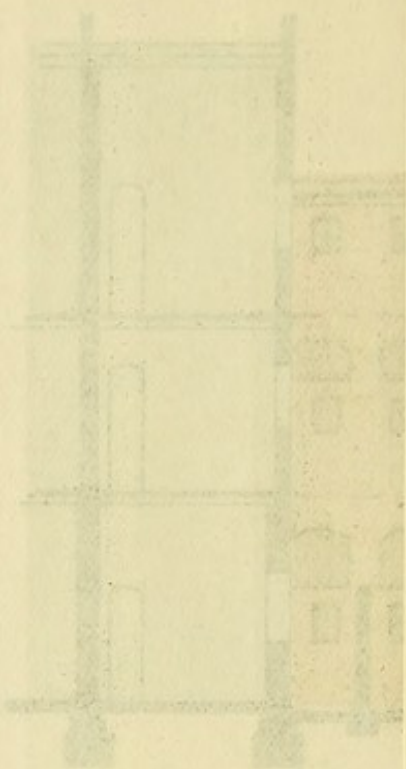
GROUND FLOOR



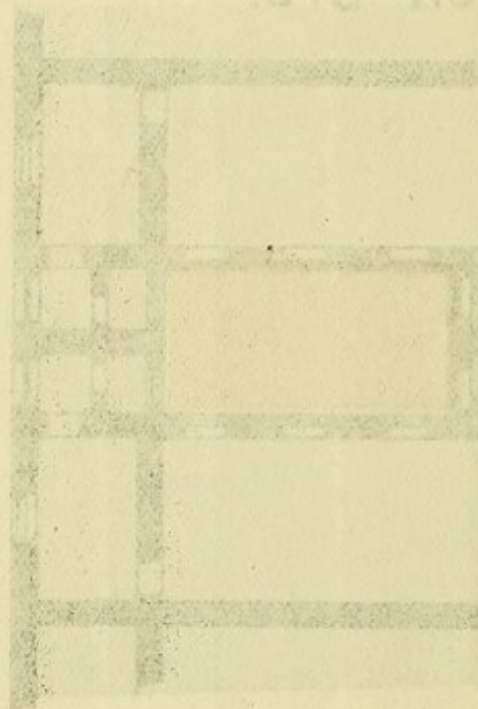
SECTION B.B.



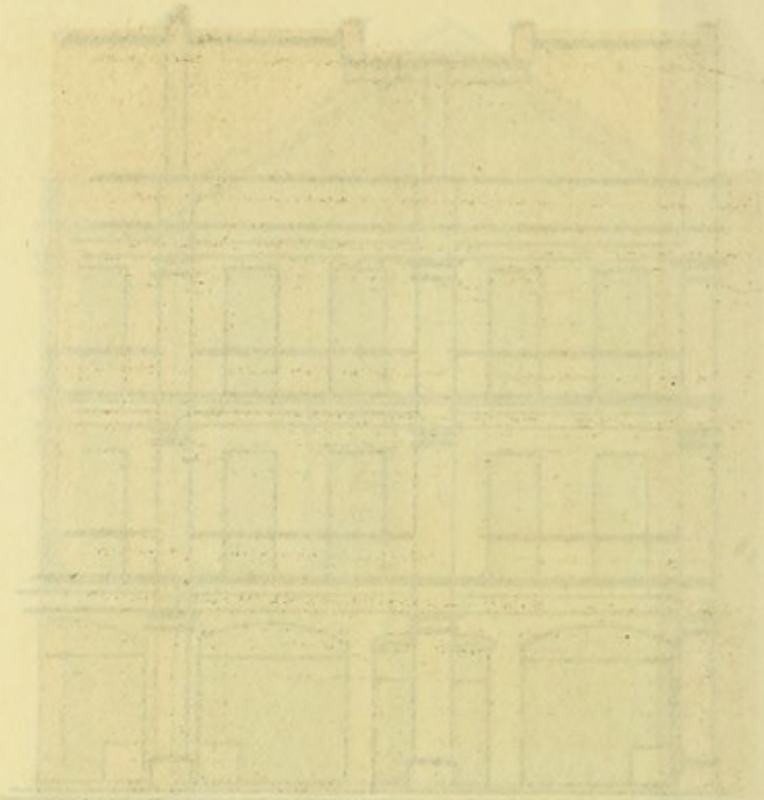
FIRST & SECOND FLOOR



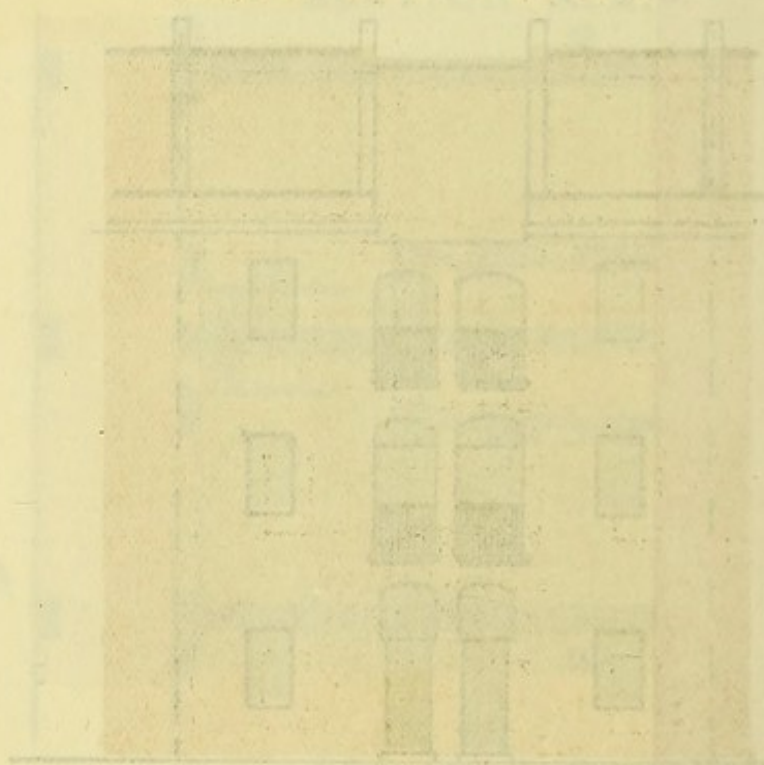
ON S.E.



COND. FLOOR



FRONT ELEVATION

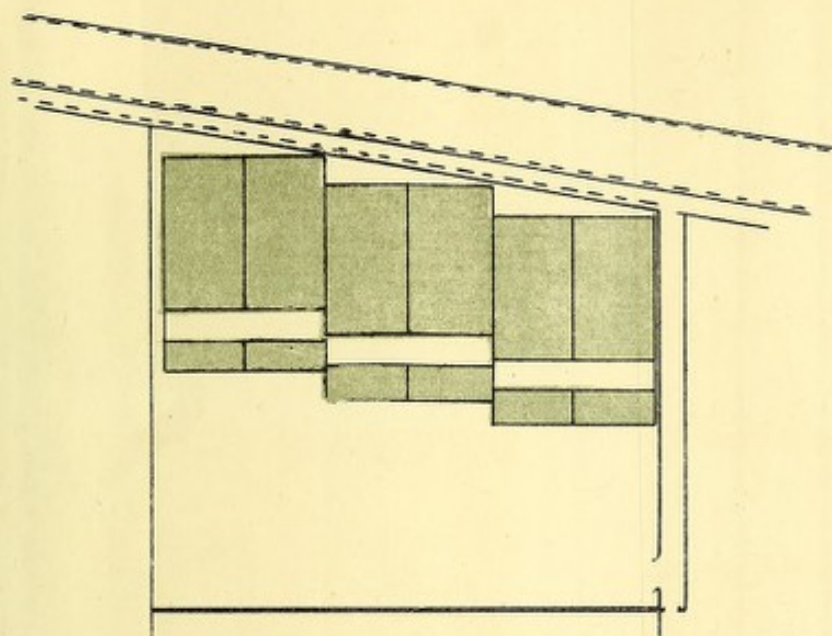


BACK ELEVATION

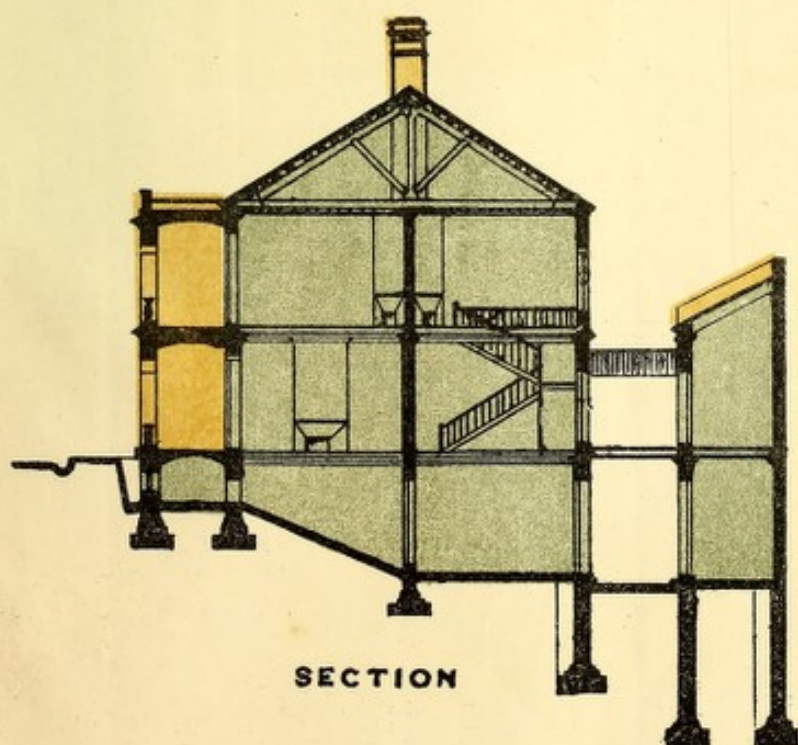
HOUSES ON I. L. 578.

PLATEXVII.

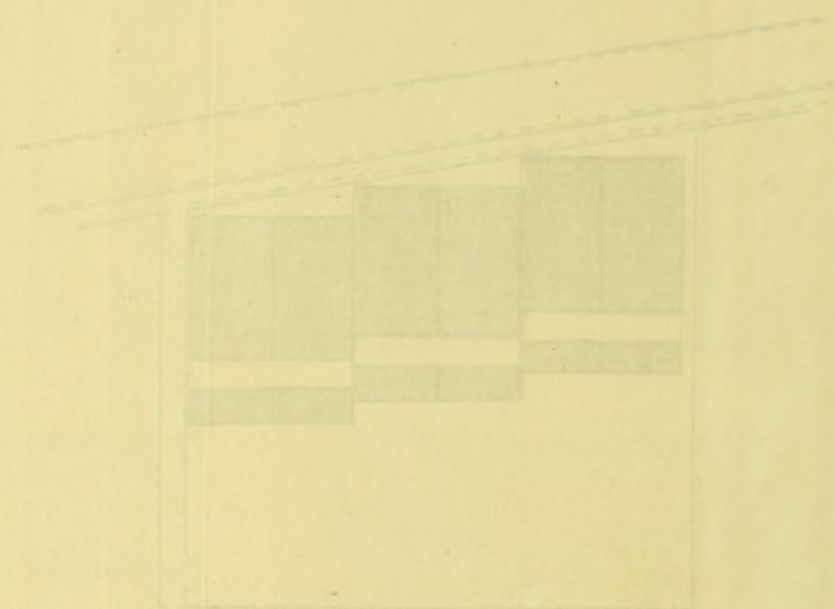
Scale 1 inch = 20 Feet.



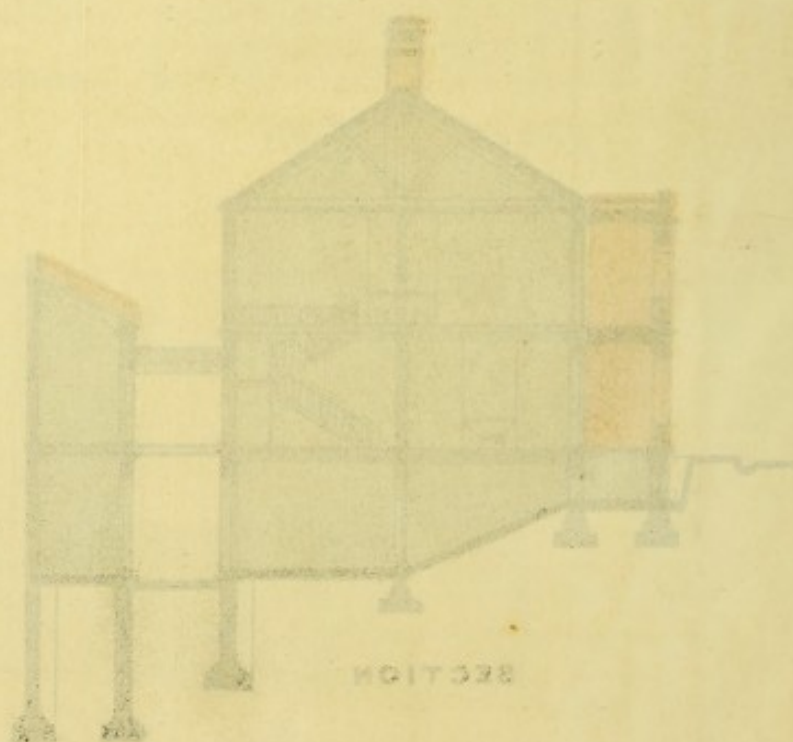
PLAN



SECTION



PLAN



SECTION



