

Report on the outbreak of plague in the Jullundur and Hoshiarpur districts of the Punjab, 1897-98 / C. H. James.

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Publication/Creation

Lahore : Punjab Government Press, 1898.

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REPORT
ON THE
OUTBREAK OF PLAGUE
IN THE
JULLUNDUR AND HOSHIARPUR DISTRICTS
OF THE
PUNJAB,
1897-98.

BY
SURGEON-CAPTAIN C. H. JAMES, I.M.S.,
Deputy Sanitary Commissioner, Punjab,

EMBODYING

NOTES AND REMARKS BY SURGEON-CAPTAIN W. RONALDSON CLARK, M.R.C.P., LOND., M.D., I.M.S.;
SURGEON-CAPTAIN A. W. BUIST, M.B., M.Ch., I.M.S.; SURGEON-CAPTAIN E. WILKINSON, F.R.C.S.,
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F.R.C.S., M.B., LOND., I.M.S.; AND DOCTORS DATTA AND FATTEH CHAND, AND OTHER
OFFICERS ON PLAGUE DUTY IN THE DISTRICT.



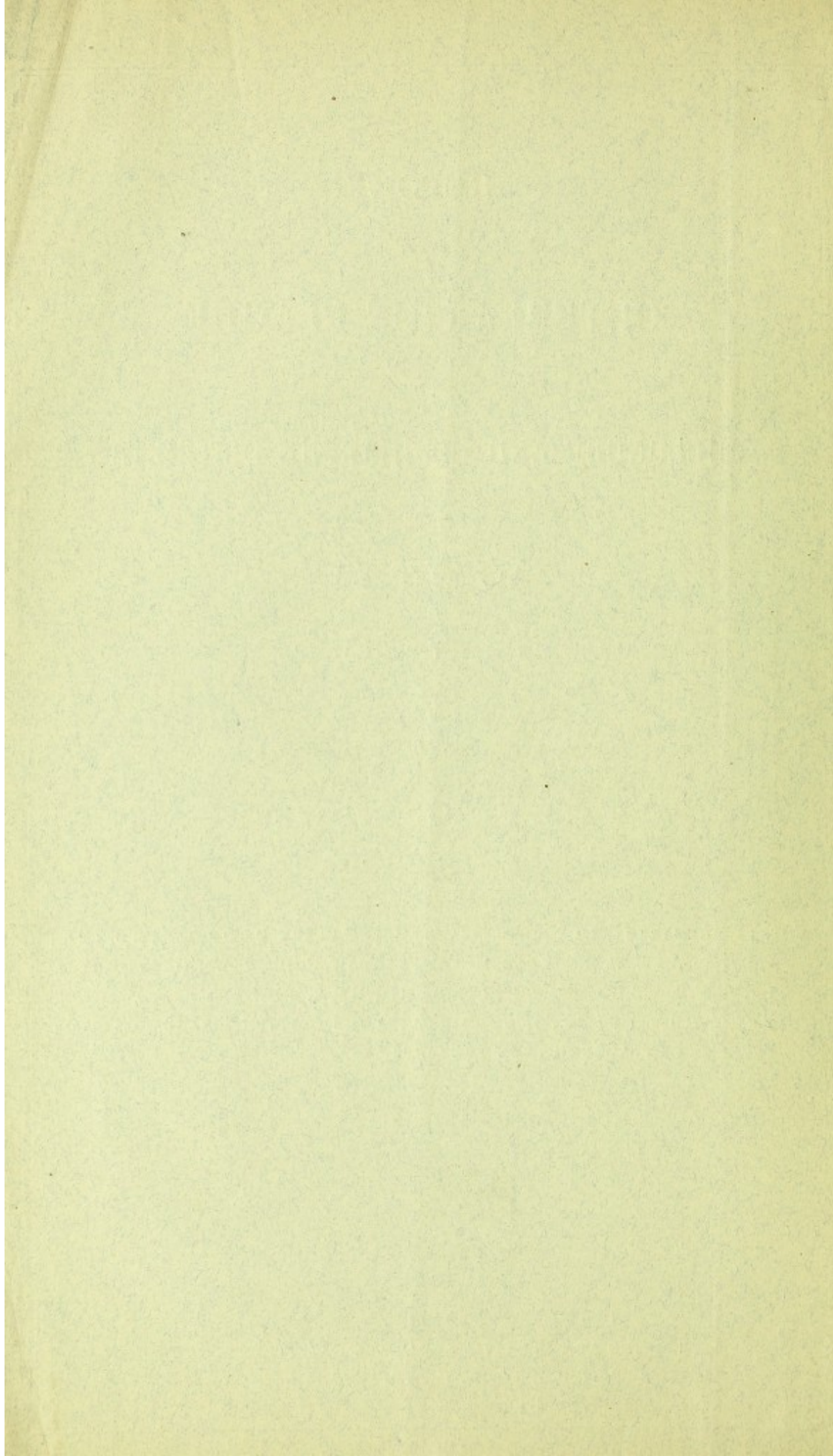
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PUNJAB. Govt. Deputy Sanitary Commissioner

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| ROYAL SOCIETY OF MEDICINE | |
| ALL | 616.923(515.8) |
| NO. | 29913 |
| DATE | 3-12-63 |

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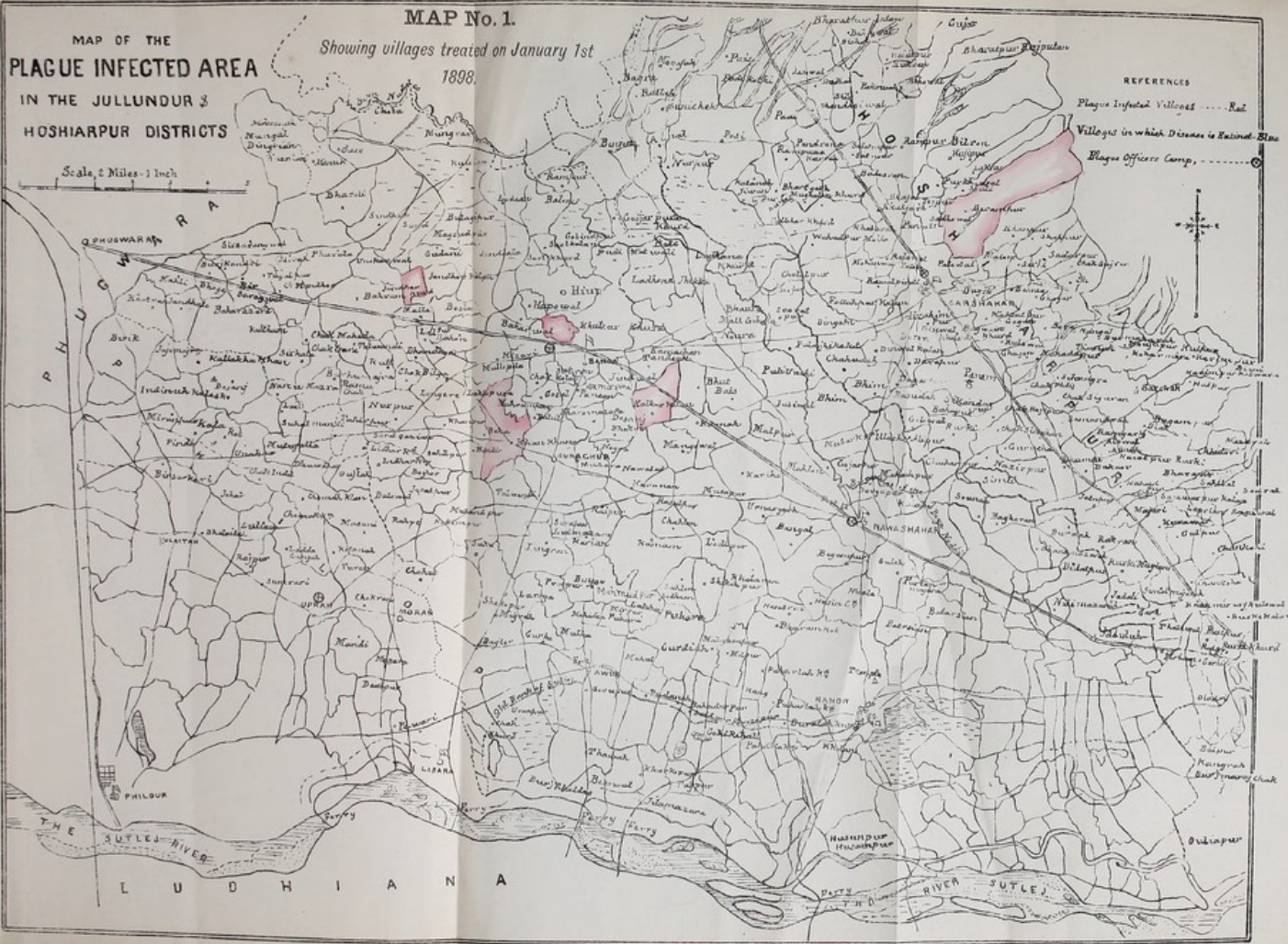
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MAP OF THE
PLAGUE INFECTED AREA
IN THE JULLUNDUR &
HOSHIARPUR DISTRICTS

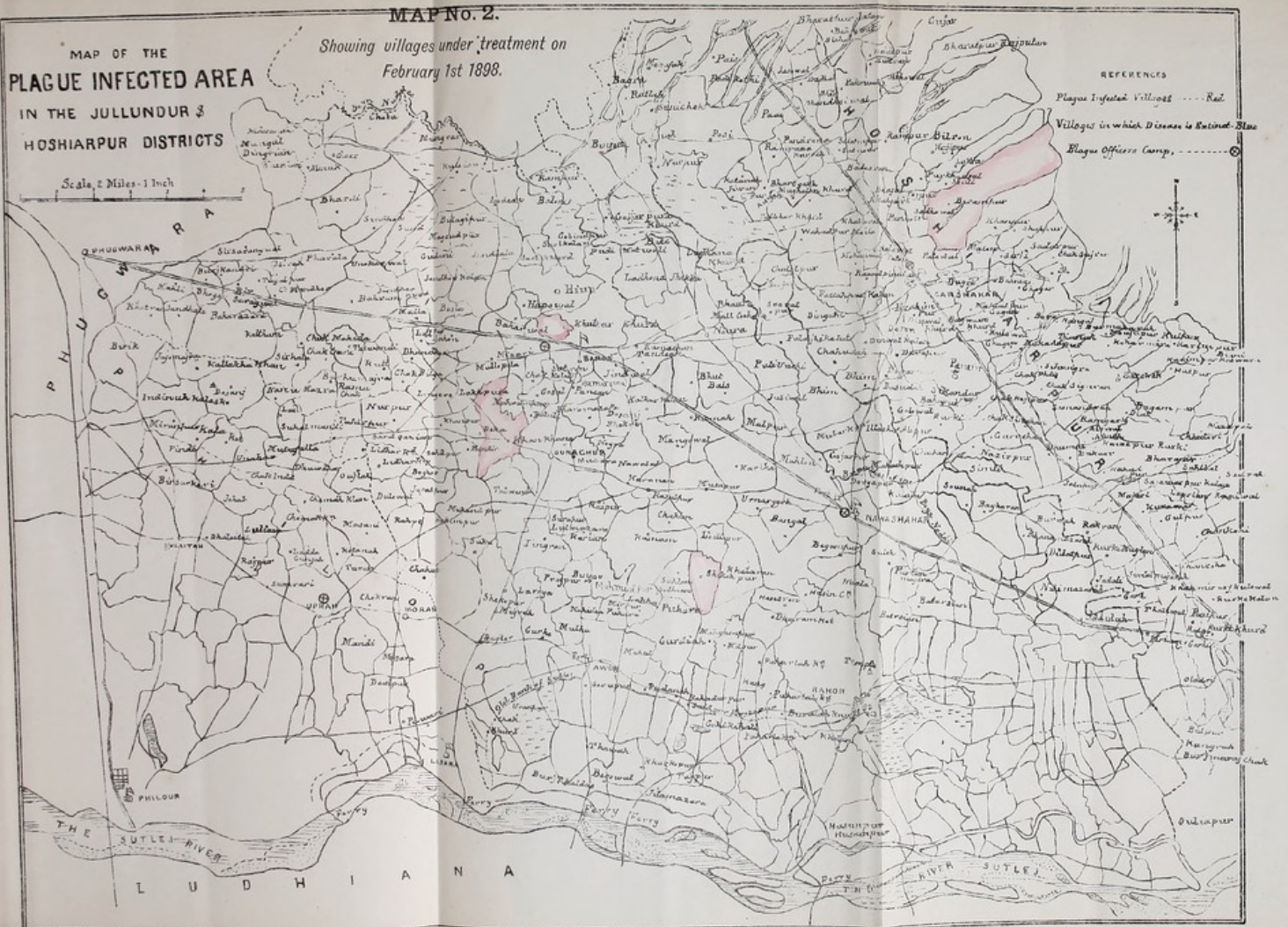
Scale, 2 Miles - 1 Inch

MAP No. 2.

Showing villages under treatment on
February 1st 1898.

REFERENCES

Plague Infected Villages Red
Villages in which Disease is Suspected Blue
Plague Officers Camp, Circle



Showing Village
Towns

THE UNIVERSITY OF

THE STATE OF NEW YORK

IN SENATE

January 18, 1881

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REPORT OF THE

COMMISSIONER OF THE

LAND OFFICE

FOR THE YEAR

1880

ALBANY:

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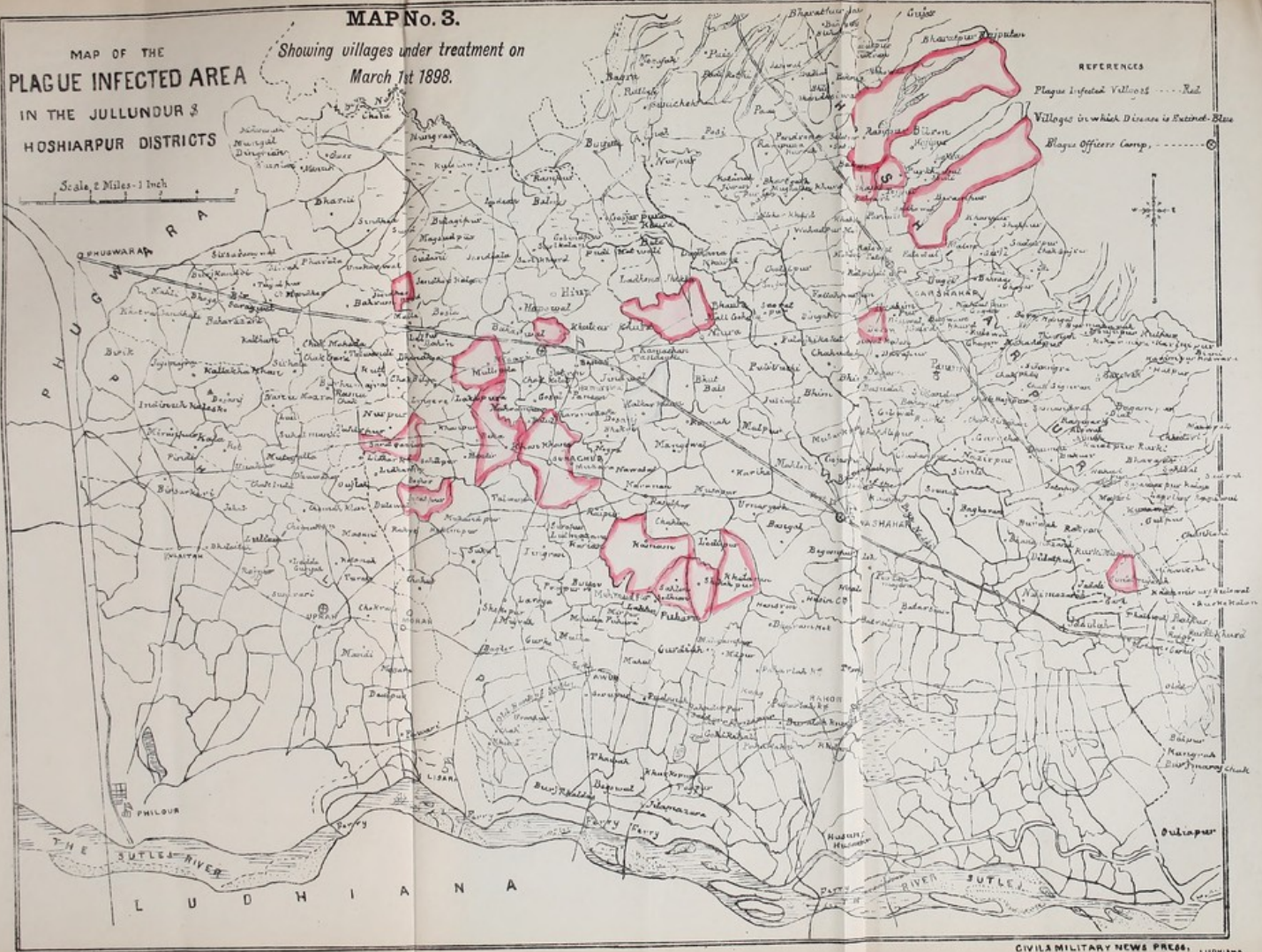
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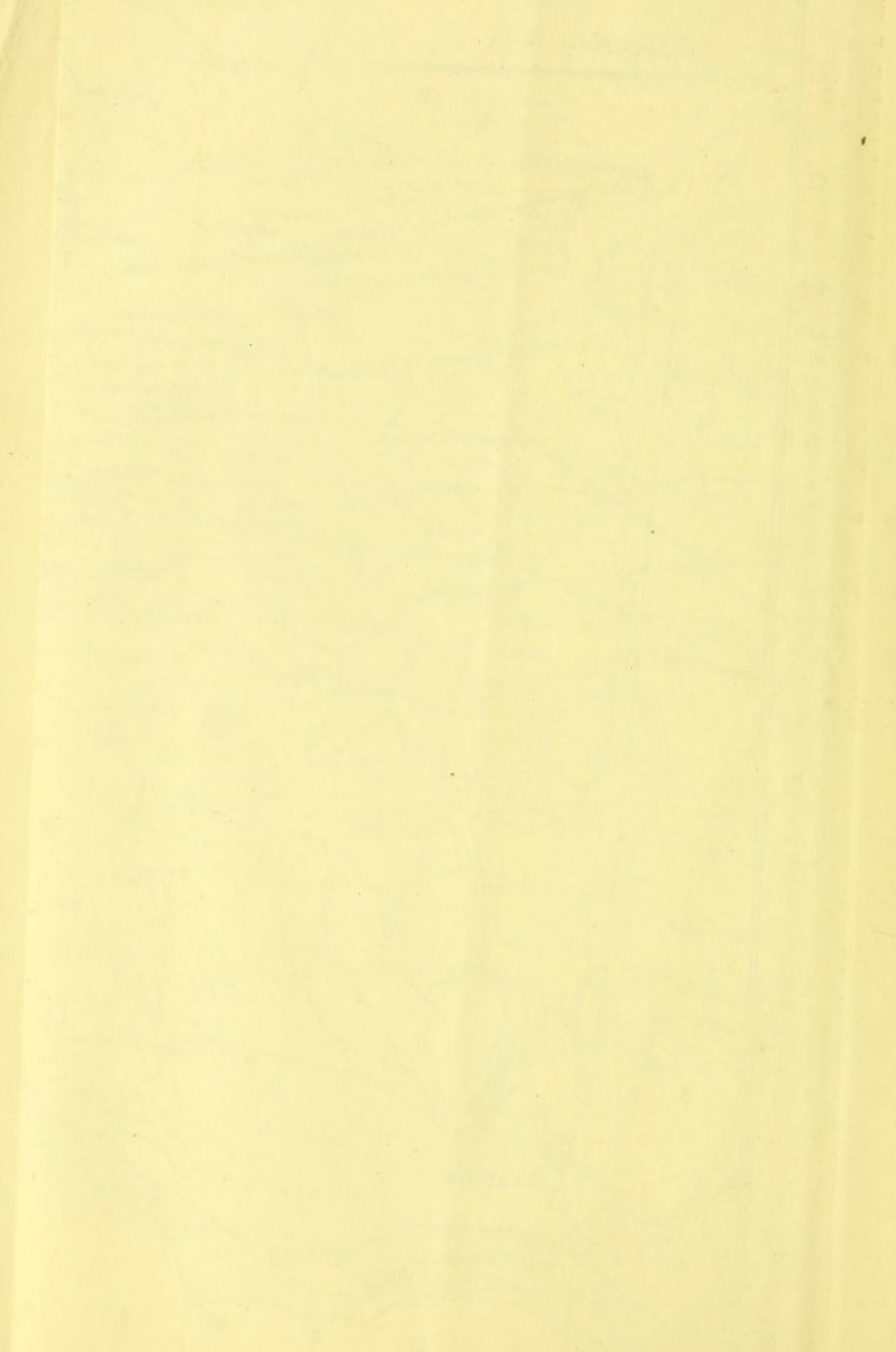
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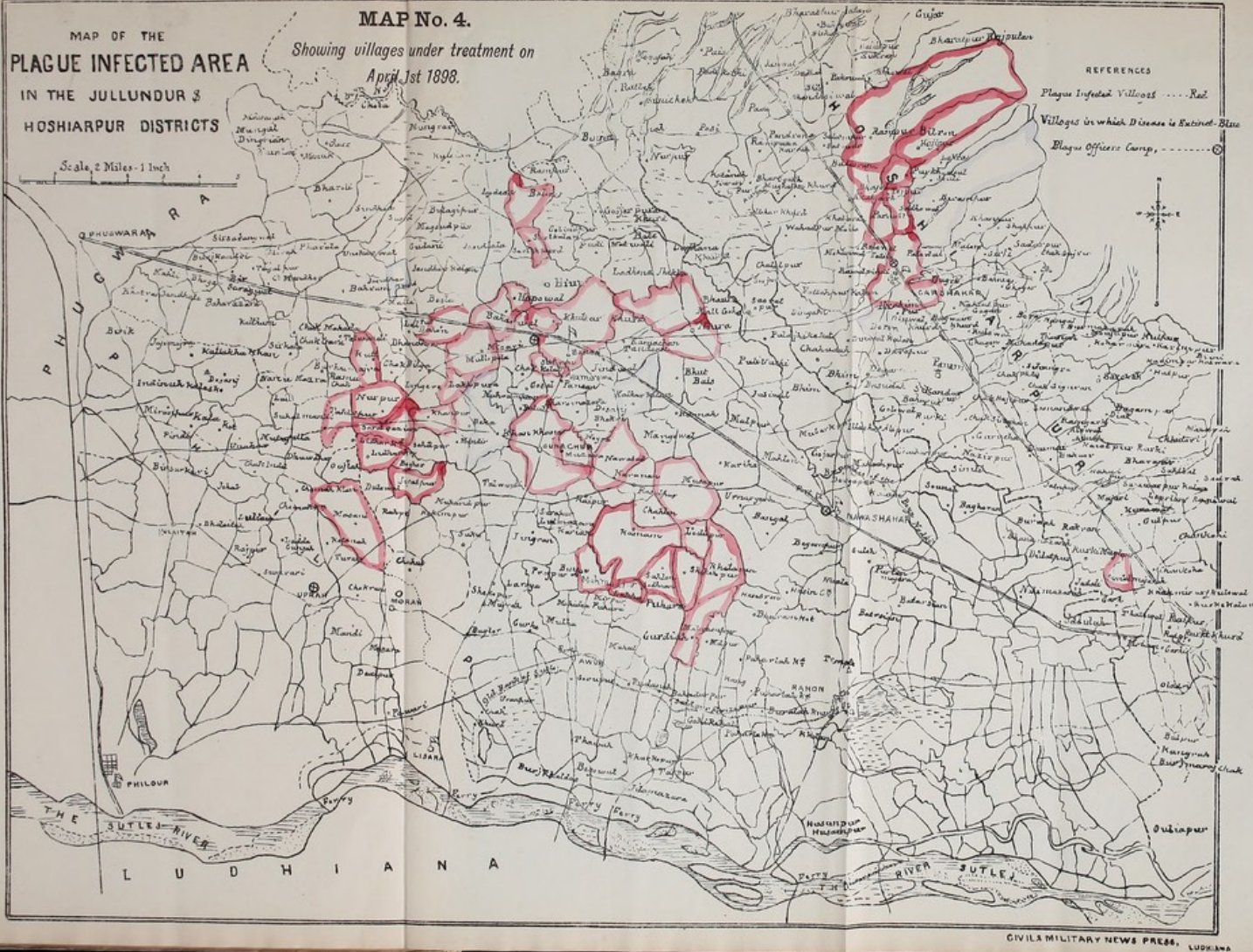
1881



Showing village
March 1

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DE LA VILLE DE
MONTREAL

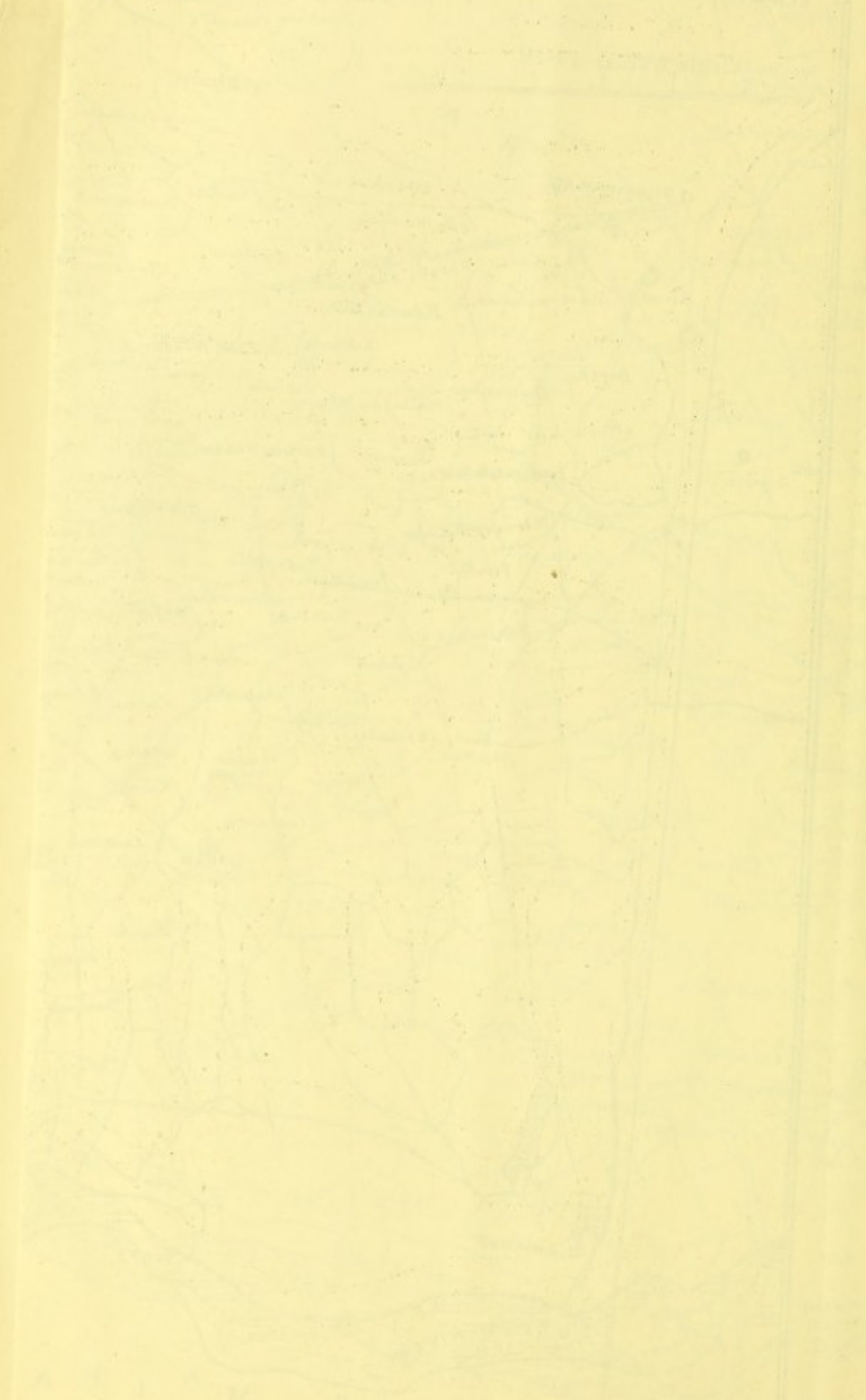






Showing villages
May 1

PLAGUE INFECTED AREA
IN THE JALANAH
HOSHANGPUR DISTRICT



MAP OF THE
PLAGUE INFECTED AREA
IN THE JULLUNDUR &
HOSHIARPUR DISTRICTS

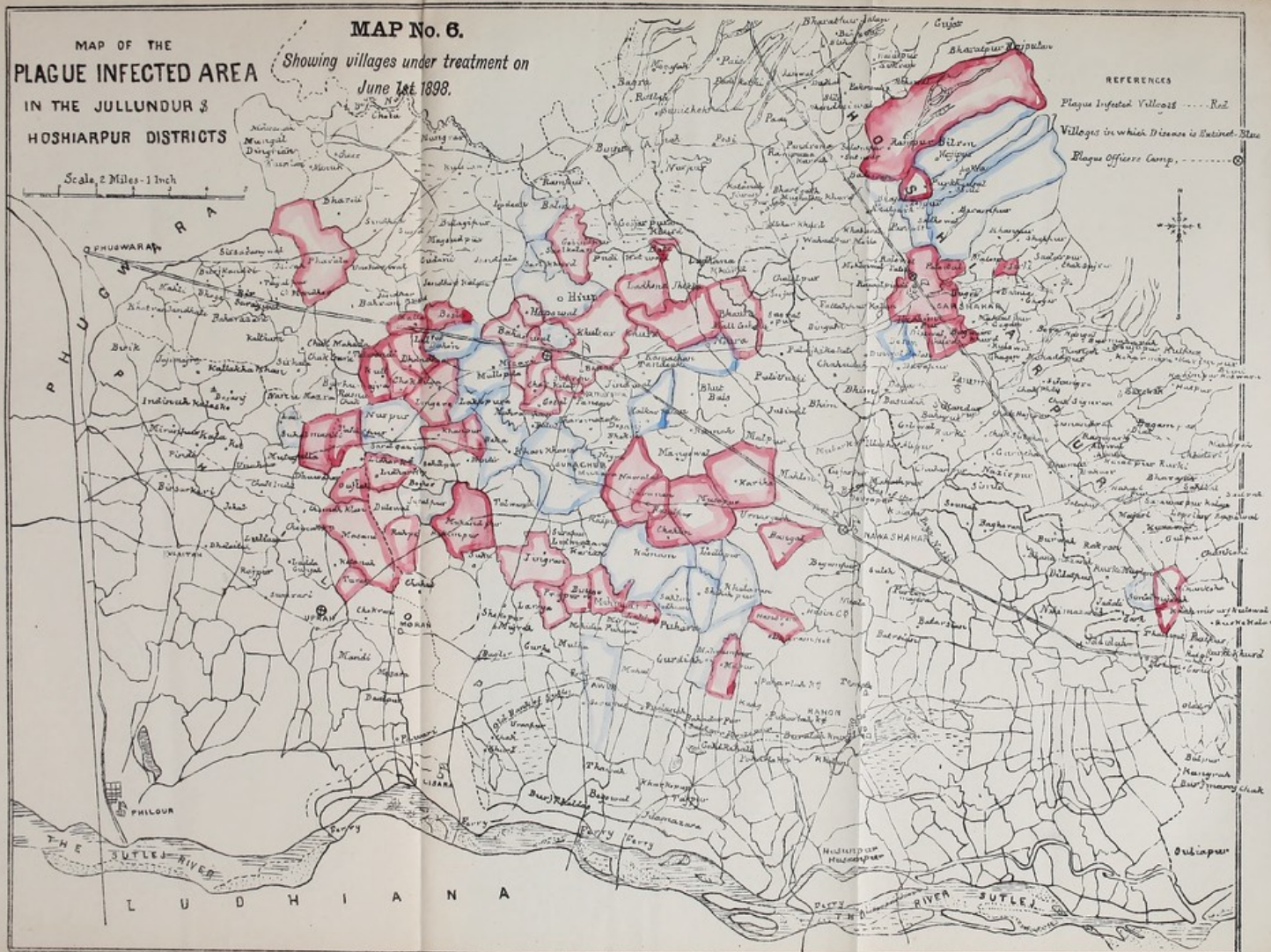
MAP No. 6.

Showing villages under treatment on
June 1st 1898.

Scale, 2 Miles - 1 Inch

REFERENCES

Plague Infected Villages Red
Villages in which Disease is Extinct Blue
Plague Officers Camp, O



SECTION I.

THE HISTORY OF THE EPIDEMIC.

The first place in the Punjab to be attacked with plague was Khatkar Kalan, a village inhabited mainly by Jat Sikhs and Muhammadan Rawals, and situated less than a mile south of the Banga-Nawashahr road in the Jullundur district.

The first case of plague in the Punjab.

The origin of the outbreak, from all accounts, appears to date from the introduction of the disease by a man returning from a pilgrimage to Hardwar, the holy city on the Ganges. The story is an interesting one, and in many points difficult to understand. It runs as follows:—

A Brahmin named Ram Saran, son of Kisben Chand, left Khatkar Kalan either at the end of February or the beginning of March last year, and in due course visited Hardwar. The man was a parohit or private priest to two other Brahmins named Sat Saran and Nanak Ram, and spent much of his time wandering about the country on their behalf.

Near the end of April (the exact date, as will presently be seen, was April 28th), he returned in an ekka in a state of high fever, and apparently very ill indeed. The driver of the ekka did not come actually up to the village, but left the poor man on the high road, nearly a mile away from this place. He was brought to the village by some of his friends and placed in his house, a small mud affair with only two rooms, situated near the middle of the village. The man was then delirious, but able to account for himself, and stated that he had been taken ill at Rahon, a town eight miles away, in a south-easterly direction, and situated three miles north of the Sutlej. He appears to have been ill several days at this town before returning to Khatkar. On arriving at his home he soon became weak, collapsed, and passed into a semi-conscious condition, and died the following morning. On reference to the thana register we find that the death is recorded as having taken place on April 29th. Ram Saran had no family, and the little property which he possessed went to two Brahmins, Bhag and Hari Ram, who kept a shop in partnership exactly in the middle of the village. Eleven days after Ram Saran's death all the Brahmins in the village collected, as is the custom among Hindus, for the funeral ceremonies which are known as the "kiria karam." The men and women collected in the small room formerly occupied by the deceased, and also outside in the lane in which the house is situated. As the accommodation was very limited, there must have been considerable overcrowding. The appointed sections of the Shastres or "Kirt" were read, and after a few hours the gathering dispersed, and everybody returned to his work and Ram Saran's house was locked up. After this there seems to have been a period of latency. For nearly two months nobody else became ill, and the disease, whatever it was, from which Ram Saran died was

The early history of the epidemic at Khatkar Kalan.

not immediately communicated to others. This brings us to the month of July. In this month, the thana records show that a *dhobi* named Chandu died of fever lasting about a week. But as he was an old man, it cannot now be determined whether he died from plague or not. He had not left the village. The next death was that of a Brahmin woman named Malan, the wife of Daya, but better known as the mother of Ralla, who was a distant relation of Ram Saran's. She lived in a lane which runs at right angles to the one in which the first death took place, and her house was situated opposite to a large well—the "Androwala" well. She was an old woman, about 60 years of age, and had not left the village for many a long day. She was ill about eight days with fever before she died (August 9th).

Her son Ralla, aged 30 years, became ill about the same time, and was ill about a month, after which he died (September 13th). He certainly had enlarged glands in his groin, but as he had previously suffered from syphilis

the symptoms were put down to this disease. While Ralla was still ill, one of the two Brahmin children belonging to Puran Chand, who lived on the south aspect of the village in a house facing the large village tank, was attacked with severe fever. The elder, Jai Kaur, aged 12 years, was ill about ten days and died before Ralla (August 30th); the younger, Rakhu, aged 4 years, became ill later, and his disease was rapidly fatal. This death is not recorded in the thana register.

Up to this time the deaths in the village, excepting the *dhobi* above mentioned and several very young infants, had been entirely among the Brahmins. The only other person besides Ram Saran who had left the village for any distant place outside the province was a Rawal named Bannah. The Rawals are great eye-doctors and travel great distances in pursuit of their profession. There were several men in this village who had visited Europe and America in their travels. In February of 1897 a company of them started for Australia. Bannah, who was a man of delicate health, accompanied his fellow-castemen as far as Poona, where his health gave way and he returned to his village in March. He seems to have suffered from phthisis, and after his return he was more or less bedridden, and in September, six months after his return, he gradually sank and died. There does not seem to be any reason to believe that this man ever suffered from plague, and as none of his relatives, or, indeed, any of the Rawals, were affected before the village was evacuated, his case may be dismissed as not directly concerning the points at present under discussion. His history is only alluded to here as being the only other source of which we have any knowledge, and which could possibly have started the epidemic.

At the beginning of August the rats in the village were noticed to be dying out in the open. This seems to have been first noticed in Hari Ram's cattle-shed near Malan's house.

In September some Jats living near Malan's house got infected. Jhandu's daughter, aged 10 years, died after an illness lasting two days; but the exact date of her death is not known; and some Chamars also became ill. The Chamars' quarters lie immediately behind Malan's house, and though there is no direct communication, the houses of some of the infected Jats actually join those belonging to the Chamars. There can be no doubt that the disease from which the people were suffering in September was true bubonic plague. But the villagers at the time were ignorant of the fact, and it was not till the weather became cooler, and the disease took a more virulent form, and larger numbers began to be attacked, that they realized the danger in their midst. Two deaths took place on October 9th, one on the 13th, another on the 14th, and no less than four on the 15th of the same month. It appears that the day on which so many deaths occurred the people became thoroughly roused to their danger and reported at the thana at Banga, a couple of miles away, that they were being devastated by some fatal form of fever, the exact nature of which they were ignorant. The Banga Hospital Assistant came immediately to the place and found many sick, and reported to the Civil Surgeon, Jullundar, that he thought that the disease was plague. The Civil Surgeon came out, and in turn reported to the Deputy Commissioner and the Commissioner. The Sanitary Commissioner and the Deputy Commissioner arrived on October 21st, and after a careful examination of the village officially announced the presence of plague.

It was not till this date that any attempt was made to try and find out how the disease got into the village, and by this time Ram Saran had been dead nearly six months. All native reports have to be carefully sifted before one can accept them as true, and in this particular case we have the additional uncertainty which lapse of time brings and the fact that there was no one present who could be trusted to observe accurately the man's symptoms. It is, therefore, with great caution that we can accept the statement that it was the Brahmin who introduced the disease and that he was the first to succumb. There are also

several points in the history of this case which require clearing up. If Ram Saran was first attacked in Rahon and remained there for several days afterwards, why is it that the epidemic did not start there instead of Khatkar, where the man only lived one night? Up to the present the town has remained quite free. Many "plague inspections" have revealed no suspicion of the disease, and an inspecting officer has had his head-quarters in the town. Then, again, what became of the ekka driver who brought in the sick man? He does not seem to have contracted the disease—at any rate, we have no evidence of it. But the most curious part of the story is that the village should have remained free so long after this man's death, and that so few cases should have occurred during the hot weather, and that it should have taken so long to develop the epidemic. Finally, we have no statement to show that the man had enlarged glands. None of these arguments, however, are sufficiently conclusive to preclude the existence of the disease. We have other instances where plague patients have stopped a short time at a place and not communicated the disease to others. This is more likely to happen in the hot weather than the cold. Our experience had shown that during the summer months the disease has very little tendency to spread, and it is extremely common for a long period to elapse between the arrival of the imported case and the onset of the first indigenous case. There is something in the hot weather in the Punjab which seems to be inimical to the spread of the disease. This may be the heat of the sun, or it may be due to some other cause indirectly connected with the sun. This experience of ours during the last three months of this year has helped us to understand why the epidemic did not make more progress during the last hot weather in Khatkar.

Very similar occurrences have this year taken place at Garbi, in the Hoshiarpur, and Aur and other villages in the Jullundur district as appear to have happened in Khatkar last year. There have been a few dropping cases of a mild type, which, had no doctor been present, would certainly have escaped detection and have kept up the infection till the cold weather. As few of these are fatal, there may even be no record to show that any illness at all has been present. In the case of Aur Dr. Wilkinson found four mild cases of plague in July. The last previous case of which we have any record in this village was on April 7th. This seems almost a parallel case to Ram Saran and Malan, who were attacked in April and August, respectively, last year.

It is, therefore, not unreasonable to suppose that the disease may have existed in Khatkar the whole hot weather in a mild form, and the record of deaths was no indication of the amount of illness present. The question as to whether Ram Saran had enlarged glands or not is not of very great importance. Had he had glands, the diagnosis would not have left much room for doubt. But there is no record of this. Many plague patients die without enlarged glands, and, as the man died so soon after his arrival and was more or less unconscious when he arrived, and as the friends were not alive to the importance of buboes, they may very easily have been overlooked even if they were present.

On the other hand, we have some indirect evidence which tends to show that this was really a case of plague.

The symptoms given, though few in number, are characteristic. The very fact that the friends could get a reliable history out of the man, although he was delirious and semi-unconscious, is very like what happens in plague.

There seems to be no doubt in the minds of villagers that this man brought plague into their midst, and the impression is strengthened when we remember that there was plague at the time at Hardwar, where the man had been. The disease at first was confined to the Brahmins, to which caste he belonged, and there seems to have been a regular sequence of cases from Ram Saran to the Chamars who were found with the disease on them when we arrived. Further evidence was found when the people evacuated the village between October 24th and 26th.

Up to this time none of the Rawals had been attacked. They lived in a separate "patti" or section of the village, cut off from the rest, and had

quite a different entrance to the Brahmins. But after they got out a woman named Barkat, wife of Nabbu, was attacked and died. As it was impossible for the infection to have arisen in the new healthy camp, the inference was that she became infected from the village. On going to her house, which lay at the very end of a long *cul-de-sac*, we were surprised to find that it adjoined, back-to-back, Ram Saran's house. In fact, the two houses were under the same roof. The Rawal family had no connection whatever with the Brahmins. This infection of houses adjoining others in which plague has occurred is so common that towards the end of the epidemic in the Banga district we made special arrangements for the disinfection of all houses surrounding and especially those back-to-back to "infected houses." The agency of communication, as we shall presently try and show, is probably rats. But whatever the agency may be, the fact remains that houses touching infected houses, although, as in this case, having their entrances in different streets and occupied by people totally different in caste and habits, are especially liable to infection. This leads us to believe that Ram Saran's house was not only infected, but probably remained so till our arrival. At any rate some infection seems to have spread and remained in Nabbu's house, and the general disturbance of all the property lying in the rooms which moving into camp entailed probably brought the woman in contact with the contagion. There were no other infected houses near from which she could have got the disease.

Then, again, Hari Ram and some of Bhag's family were almost simultaneously attacked with plague when they moved out of their houses. They may have contracted the disease in several different ways; but when we remember that these two men inherited Ram Saran's property, which probably lay untouched till they prepared to go into camp, one is inclined to the belief that they may have been infected from this property, and thus the deceased Brahmin may have been the indirect cause of their being attacked. In short, all Ram Saran's surroundings seem to have been ultimately attacked. The village of Khatkar is fifteen or sixteen miles away from the railway, and there is not much likelihood of many people coming from or going to long distances without it being generally known in the village. Moreover, we had the complete confidence of the people, who helped us in every way in their power, and were ready to give us any information we wanted. This being the case, and there being a total absence of evidence of any other sources of infection, one is almost forced to the conclusion that Ram Saran brought plague to Khatkar Kalan and was the direct means by which the terrible epidemic which has given us so much anxiety during the last nine months was born and bred.

We have discussed this case at some length, as the conclusions are extremely important. If our deductions are true,—and we believe they are true,—then it shows that plague can exist in a mild form in our villages during the hot weather unsuspected, and therefore unheeded, only to break forth with renewed vigour when the winter commences, and to carry death and desolation far and wide. We cannot, therefore, trust to the hot weather alone to stamp out the pest, but must be on the alert and ready to use all the other means which we have at hand.

Plague is no ordinary illness. It is far more infectious than any other disease of which we have any knowledge, and more deadly than most. It consequently calls for severer and more thorough measures to check its spread. It was determined from the commencement not to tinker with it, but to deal with it in the most wholesale manner possible, and arrangements were at once put on foot for completely evacuating the entire village and all its outlying buildings. Of course, every one was quite unprepared to meet the epidemic, and arrangements were more slowly carried out than they were later on, when the establishment was in better working order, for other villages. But in spite of this the Chamars and sweepers, who were at that time the worst sufferers, were got out by the 24th, and the whole village of 1,355 people was out in camp by the 29th of the month.

The effects of the hot weather alone are not sufficient to stamp out the disease.

Immediate measures were taken to evacuate Khatkar Kalan.

The effect on the disease was most marked. From the time the executive officers arrived on the scene on 21st to the 29th, when the whole village was empty, we had cases as follows :—

| | | | | | | | |
|------|-----|-----|----------|------|-----|-----|----------|
| 21st | ... | ... | 6 cases. | 25th | ... | ... | 7 cases. |
| 22nd | ... | ... | 7 " | 26th | ... | ... | 3 " |
| 23rd | ... | ... | 0 " | 27th | ... | ... | 0 " |
| 24th | ... | ... | 3 " | 28th | ... | ... | 4 " |

and 29th 2 new cases.

After the evacuation there were 2 cases on the 30th, 3 cases on November 1st, 1 on the 5th, 1 on the 6th, 1 on the 17th, and last dropping case on December 3rd. In fact there were 32 new cases in the nine days previous to and during evacuation and only 9 afterwards. This drop in the cases when the people got out into camp has been most marked throughout the operations in all the villages with which we have had to deal, and will be referred to again in greater detail in another section of this report.

There were altogether 72 cases and 39 deaths during the month of October.

The disinfection of the village was completed at the end of November : a few days were spent in making a final inspection of all the houses. The Bharais,—a caste of Muhammadan beggars,—who had not been attacked by plague, were allowed to return to their houses on November 30th ; the Rawals followed on December 6th ; and then the various camps followed, till everybody had returned on December 26th. The village was, however, still kept cordoned in order to observe whether any "infection" had remained in the houses and whether any fresh cases would occur after the return of the people. No recrudescence took place. The medical officer had a final roll-call on January 6th, and declared the village free of infection, and after this the police were removed and the people were free to come and go as they pleased.

So far the arrangements made seem to have been successful. The disease was decidedly on the increase when we arrived ; it practically stopped after the village was evacuated and the last case occurred thirty-five days after evacuation. The infection, which had been several months lurking about the village, was completely eradicated after disinfection, and the place has now (July) remained free for seven months.

These are, of course, most encouraging results, and as similar results have been obtained in practically every village which has been dealt with, it proves that our methods, if not perfect, are certainly effectual.

But we did not stop the disease from spreading to many other villages. For several weeks, after most careful search by two most able medical officers, one in the Jullundur district and another in the Hoshiarpur district, nothing suspicious was obtained, and we almost felt that the disease had been checked. But it had already passed beyond our police cordon : secretly and surely the seeds of destruction were ripening.

On November 9th, plague was discovered at Jhandher Khurd, a village seven miles away from our first village, a little north of the Phagwara-Banga main road, and about $4\frac{1}{2}$ miles east of the latter town. No satisfactory explanation as to how the disease reached this village was ever obtained, but as the Chamars were first affected, and as some of them were related to the Khatkar Chamars, the probable solution lies in the fact that some one brought the infection from our former village. Six suspicious deaths had occurred quite lately before our arrival. The first of these was Rajji, wife of Fattu and sister of Jawabar. She died about October 25th, after an illness of ten days. Her brother, Jawabar, was attacked with plague on November 19th, after our arrival, and died on the 28th. There is little doubt that disease existed in this village about the 15th October and therefore before the authorities had realized the existence of the malady in Khatkar Kalan, our first village.

Khankhanan, a large village of 2,500 people, was discovered on November 20th, though rumours had reached us some days previously and visits had been made by an Hospital Assistant. It was found to be badly infected, and no less than 115 cases of plague occurred in it before all the people were evacuated on December 6th. The means of infection in this case was also obscure.

It appears that a sort of shrine called "Jhandeji," situated about a quarter of a mile east of Khatkar Kalan is considered a place of pilgrimage and a fair takes place in it every Sunday. Among the people who visited the fair very regularly,—in fact they constantly sold articles of diet, such as *ata*, *ghi*, sugar, &c.—were a Brahmin named Tulsi and a Khatri named Bhagwana. The first case of which we were able to obtain any definite information was the man, Tulsi, whose case presented difficulties in that he had for many years suffered from lupus of the face, and was in a very debilitated state of health. However, three deaths from plague took place in Bhagwana's house early in November. It is supposed that either Tulsi or Bhagwana, or both, got some of their property infected at Jhandeji, and this property being carried to Khankhanan, afterwards started the disease in their houses. This, however, is chiefly conjecture, as there are not a sufficient number of facts forthcoming to make this story absolutely reliable.

Another supposition is that at the time Khatkar Kalan was being cordoned and evacuated, some clothes were sent from Khatkar to Khankhanan, to avoid their being spoiled by disinfection. In one case we know this was done, but on investigation the clothes were found to have come from a "healthy" family, and none of the recipients ever contracted the disease. But there may have been other cases of which we have no information where infected clothes may have been thus smuggled into this village: on the whole, we must confess that we have no certain knowledge as to how the disease was actually introduced. But the fact remains that the disease spread rapidly from Bhagwana's house all over the quarter of the village known as Dalel Singh's *patti*.

The medical officer visited the village on November 21st, but was unable to decide whether the case he saw—an old woman with high fever—was really plague or not, as the typical symptoms had not then developed. He came again the following morning, to find that the old woman had died a few hours before his arrival. However, the corpse had been locked up in the room where the woman had lived and had been kept for his inspection. But when the body was inspected, to the horror of all, it was found that the nose and part of one cheek had been gnawed away—presumably by rats. The investigation proved that the old woman had died of plague, and the body was burned as soon as possible. But during the next few days every house in the block of buildings in which the corpse was found was affected. Brahmins, Jats and Telis were attacked. When the houses were afterwards disinfected, a number of dead rats were found in them.

At first the people of Khankhanan showed a great disinclination to come out into camp, though they had every desire to have their sick treated. Much persuasion and tact had to be shown. In fact it was not till they saw the terrible inroads the disease was making in their numbers that they changed their minds. When at length permission was given them they literally ran out of their dwellings, and in a few days six good camps were formed. These camps were afterwards increased to ten in number, by forming fresh segregation camps and also splitting up a large health camp situated at the south of the village. There were 96 cases and 39 deaths during the month of November in the infected villages of the Jullundur district.

While we had been treating these three villages the disease had already found a new resting-place in a village in the Hoshiarpur district. This village was Birampur, which is about ten miles from Khankhanan. The history of its infection was as follows:—About the 18th to 20th October, and before a regular cordon had been formed round Khatkar, a sweeper woman, the sister of one Labhu who had plague at the time, and in

Theories as to the mode of its infection.

Disease discovered on November 21st. A plague corpse attacked by rats.

The evacuation of Khankhanan.

Monthly total of cases and deaths.

The outbreaks in the Hoshiarpur district—Birampur. Disease taken by a Chamar woman from Khatkar Kalan.

whose house she lived, ran away to Birampur with her child. She got ill a few days later and died. But it was not till December 11th that the disease was discovered and took on an epidemic character. Birampur being in the Hoshiarpur district, was at first worked by a separate establishment under the Deputy Commissioner of that district.

Khatkar Khurd was found to be infected on December 28th. But as the first cases were found early, and the whole village was immediately evacuated, it escaped with only 10 seizures.

Up to the end of the year there had been four villages attacked in the Jullundur district and one in the Hoshiarpur district. An Assistant Commissioner, a medical officer and a police officer were the Europeans attached to each of the—two circles. One other medical officer devoted his whole time to the inspection of villages in order to detect plague as early as possible, and two other Assistant Commissioners came to learn the work during the last month. The headquarters of the executive staff of the Jullundur district was at first at Khatkar Kalan, but was moved on November 23rd to Khankhanan. The plague officers in the Hoshiarpur district had their camp at Garhshankar.

There were 28 cases and 20 deaths during the month of December in Birampur in the Hoshiarpur district, and 106 cases and 77 deaths in the infected villages of Jullundur district.

During January no new villages were discovered, and again our hopes were raised to believing that we had got to the end of the epidemic. Map 1 shows the situation of the five villages which had been attacked up to this time; Map 2 the villages being treated on February 1st.

There were 19 cases and 11 deaths during the month of January in the infected villages of the Jullundur district, and 17 cases and 12 deaths at Birampur in the Hoshiarpur district.

The following villages were declared free of plague during the month of January in the Jullundur district:—

- (1). Khatkar Kalan, January 6th.
- (2). Jhandher Khurd, „ 29th.

With the onset of February our real troubles began. The following villages were discovered to be infected on the dates specified:—

JULLUNDUR DISTRICT.

| | | | |
|-----------------|-----------------------|----------------|-----------------------|
| Shikohpur, | February 1st. | Sahlon, | February 20th |
| Sirhal Qazian, | „ 3rd. | Mehl Gahla, | „ 23rd |
| Mallupota, | „ 12th. | Kumam, | „ 26th |
| Ganachour, | „ 13th. | Jagatpur, | „ 27th |
| Jhandher Khurd, | „ 19th (re-infected). | Khatkar Khurd, | „ 28th (re-infected). |

HOSHIARPUR DISTRICT.

| | | | |
|----------------|---------------|----------|----------------|
| Parkhowal, | February 3rd. | Deron, | February 19th. |
| Bilron, | „ 7th. | Bhajjal, | „ 21st. |
| Simmal Mazara, | „ 9th. | | |

The only village declared free of plague during the month of February was Khatkar Khurd (February 19th) in the Jullundur district.

Shikohpur was 6½ miles from the plague officers' camp, and after it had been evacuated on February 2nd a fresh officers' camp was near it. This afterwards became the head-quarters of a separate circle, called the Nawashahr circle. When the hot weather came on, the officer here moved into a bungalow in Nawashahr itself. Other villages in the vicinity of Shikohpur, such as Sahlon, Kumam, &c., soon became affected, and there were eventually 21 villages infected in this circle. The details of these have been collected by Dr. Smith, and are given on page 67 *et seq.* of this report.

The circle was in a way subordinate to the previously formed circle, which was now called the "Banga circle," for the transmission of stores, huts and the various returns, but it had a separate establishment and for all other practical purposes was independent of the former circle.

There were 211 cases and 121 deaths during the month of February in the infected villages of the Jullundur district and 72 cases and 31 deaths in the infected villages of the Hoshiarpur district.

Cases and mortality during February.

Further spread of the disease during March.

Villages discovered during the month.

In March the epidemic spread to 23 more villages in the Jullundur district and 4 more in the Garhshankar tahsil as follows :—

JULLUNDUR DISTRICT.

Banga Circle.

| | | | |
|-------------|------------|-----------------|-------------|
| Balon, | March 2nd. | Haphowal, | March 12th. |
| Lakhpur, | " 5th. | Chak Bilga, | " 13th. |
| Nurpur, | " 7th. | Dhaban, | " 13th. |
| Salb Kalan, | " 8th. | Tahirpur, | " 18th. |
| Naura, | " 10th. | Mazara Nawabad, | " 21st. |
| Masani, | " 10th. | Sotran, | " 24th. |
| Banga, | " 11th. | Lidhar Kalan, | " 29th. |
| Katt, | " 15th. | Khanpur, | " 30th. |

Nawashahr Circle.

| | | | |
|-----------|------------|------------|-------------|
| Ghotaran, | March 1st. | Mahmudpur, | March 22nd. |
| Karnana, | " 2nd. | Musapur, | " 25th. |
| Lodhipur, | " 7th. | Sodhian, | " 29th. |
| Mehampur, | " 9th. | | |

HOSHIAHPUR DISTRICT.

| | | | |
|-----------|------------|--------------|-------------|
| Sadhowal, | March 6th. | Parowal, | March 24th. |
| Hajipur, | " 9th. | Garhshankar, | " 30th. |

Villages declared free after termination of plague operations in them.

The following villages were declared free of plague during the same month :—

JULLUNDUR DISTRICT.

| | | | |
|-----------------|-------------|----------|-------------|
| Khankehanan, | March 17th. | Karnana, | March 29th. |
| Jhandher Khurd, | " 7th. | | |

HOSHIAHPUR DISTRICT.

| | | | |
|-----------|-------------|---------|-------------|
| Birampur, | March 26th. | Dheron, | March 30th. |
|-----------|-------------|---------|-------------|

In this month it will be noticed that besides the numerous villages affected two important towns became infected, *viz.*, Garhshankar and Banga. The former is the tahsil head-quarters for the most infected area of Hoshiarpur, and Banga the tahsil head-quarters and post office for the similarly affected part of the Banga circle. It was on both these towns that the plague officials depended for many of their supplies. About this time, more civil and medical

Increase in the establishment on plague duty.

Improved system of observation instituted.

officers began to arrive as well as a large number of police, and arrangements had now to be made on a larger scale. Instead of having only two medical officers on inspection duty to discover fresh cases of plague, each of the plague infected areas in the two districts were divided into circles, each had a European officer at its head with a Tahsildar or Naib-Tahsildar, a Hospital Assistant and Kanungos. Extra nurses and dhais were entertained, who were ready for emergencies.

The circles were as follows :—

| | |
|----------------------|------------|
| JULLUNDUR DISTRICT. | |
| Banga. | Phagwara. |
| Nawashahr. | Aur. |
| Rahon. | |
| HOSHIAHPUR DISTRICT. | |
| Garhshankar. | Mahipur. |
| Saibi. | Balachaur. |

A system of rewards for early information regarding newly attacked villages which had been initiated in the previous month now came fully into force, and had probably better results than any other system. Several lambardars were also heavily punished during the month for concealing the existence of the disease in their villages. The salutary effect of these convictions is difficult to over-estimate. There is much to criticise in our system of inspections. But it must be admitted that, on the whole, it was highly successful, and the early information of fresh outbreaks put us in a better position to deal with the epidemic.

There were 869 cases and 564 deaths during the month of March in the infected villages of Jullundur district, and 132 cases and 90 deaths in the infected villages of Hoshiarpur.

Cases and mortality during March.

The epidemic most
severe during April.

During April we had no less than 34 new villages attacked and the epidemic was certainly at its height.

JULLUNDUR DISTRICT.

Banga Circle.

| | | | |
|---------------|------------|-------------|-------------|
| Bahrwal, | April 1st. | Mukandpur, | April 15th. |
| Mazari, | " 2nd. | Gobindpur, | " 15th. |
| Sath Khurd, | " 3rd. | Lehal, | " 17th. |
| Heon, | " 3rd. | Chak Kalal, | " 17th. |
| Langeri, | " 4th. | Poonian, | " 18th. |
| Lalpur, | " 5th. | Rahpa, | " 22nd. |
| Bisla, | " 6th. | Gosal, | " 22nd. |
| Bika, | " 10th. | Mallah, | " 25th. |
| Sirhal Mandi, | " 14th. | Aujla, | " 27th. |
| Dhandhua, | " 14th. | | |

Nawashahr Circle.

| | | | |
|-----------|------------|-----------|-------------|
| Chahlan, | April 6th. | Kariha, | April 20th. |
| Karnana, | " 6th. | Piragpur, | " 21st. |
| Aur, | " 7th. | Rasulpur, | " 21st. |
| Malpur, | " 9th. | Bhangal, | " 24th. |
| Hansaron, | " 12th. | Bajon, | " 26th. |

HOSHIARPUR DISTRICT.

| | | | |
|----------|-----------------------|----------|---------|
| Samvali, | April 4th. | Garhi, | " 20th. |
| Bilron, | " 12th (re-infected). | Chinkoa, | " 23rd. |
| Kulewal, | " 15th. | | |

The following villages were declared free of plague in the Jullundur and Hoshiarpur districts during the month of April:—

JULLUNDUR DISTRICT.

| | | | |
|----------------|-------------|--------|------------|
| Shikohpur, | April 19th. | Naura, | April 3rd. |
| Khatkar Khurd, | " 7th. | Aur, | " 19th. |

HOSHIARPUR DISTRICT.

| | | | |
|------------|-------------|-----------|-------------|
| Bhajjal, | April 14th. | Sadhowal, | April 19th. |
| Purkhowal, | " 18th. | | |

The Jullundur and Hoshiarpur infected area, which had previously been kept more or less separate, were now brought under the supervision of one Plague Deputy Commissioner, Major Inglis.

The whole plague area put under the orders of Major Inglis, Special Plague Deputy Commissioner.

This month was an important one in the history of the epidemic, not only because the largest number of new villages were discovered to be infected about this time, but also because of fresh troubles in the way of the discontent and resistance to the measures being carried out. The people began to get an idea into their heads that Government had no intention of compelling them to leave their villages unless they themselves wished to come out. It is difficult to trace how this idea originated, but the practical result was very serious. Garhshankar was the first to openly defy authority, and refused to come out into camp. Their example was quickly followed by other villages in the Nawashahr circle. Kariha, Bhangal and Piragpur became defiant. By the time the Commissioner, Mr. Silcock, came down on April 25th, the aspect of affairs had become critical. Colonel Rennick, the Deputy Commissioner, induced the people of Kariha to conform to orders without the use of force. But it was not till the beginning of May, and then not till the people had seen for themselves the terrible effect of remaining in the villages, that they were induced to come out. In the case of Garhshankar recourse to arms had to be taken. The police were opposed when trying to enter the town and firing took place. Nine men were killed and 35 wounded in the affray. But the incident, regrettable though it was, had a marvelously salutary effect. On hearing that Garhshankar had been evacuated, Kariha, Bhangal and Piragpur came out into camp immediately, and after this we never had any more difficulty in evacuating villages. Though the casualties at the Garhshankar riots were very heavy, they are small compared to what the mortality from plague would have been had these severe measures never been taken. It must be remembered that several villages took their cue from Garhshankar, and on the result of this place hung the fate of many places—one may say the fate of all the villages in the district. It was the great turning point in the plague operations. The weather now began to be very hot, but the epidemic at first showed no signs of abating.

Kariha, Bhangal and Piragpur refuse to come out into camp.

The Garhshankar riots.

There were 861 cases and 491 deaths during the month of April in the infected villages of the Jullundur district and 203 cases and 119 deaths in the infected villages of Hoshiarpur district. During May the following villages were attacked:—

JULLUNDUR DISTRICT.

Banga Circle.

| | | | |
|----------------|-----------|---------|-----------|
| Chhokran, | May 10th. | Bhaura, | May 25th. |
| Pharala, | " 19th. | Turan, | " 25th. |
| Ladhana Jhika, | " 21st. | | |

Nawashehr Circle.

| | | | |
|---------|-----------|----------|-----------|
| Laroya, | May 18th. | Jhingar, | May 26th. |
|---------|-----------|----------|-----------|

HOSHIARPUR DISTRICT.

Bhagwain, May 19th.

A large number of villages declared free after the termination of the operations during the month.

The following villages were declared free:—

JULLUNDUR DISTRICT.

| | | | |
|----------------|----------|-----------------|----------|
| Sirhal Qazian, | May 5th. | Salh Kalan, | May 5th. |
| Mallupota, | " 13th. | Dhahan, | " 17th. |
| Sahlon, | " 9th. | Lehal, | " 31st. |
| Kamam, | " 14th. | Mazara Nawabad, | " 19th. |
| Jagatpur, | " 26th. | Salh Khurd, | " 17th. |
| Ghataron, | " 28th. | Mehrampur, | " 31st. |
| Balon, | " 4th. | Heon, | " 12th. |
| Lakhpur, | " 14th. | Lalpur, | " 28th. |
| Nurpur, | " 13th. | Ganachaur, | " 31st. |
| Lodhipur, | " 24th. | | |

HOSHIARPUR DISTRICT.

| | | | |
|----------------|----------|----------|----------|
| Simbal Mazara, | May 2nd. | Parowal, | May 7th. |
| Sanwali, | " 5th. | Hajipur, | " 8th. |

The work now began to diminish. On account of the great distances in the Banga circle a new sub-division was formed having its head-quarters at Upra, a village nearly 10 miles south-west of Banga. A small bungalow was built, and an Assistant Commissioner, a doctor and a police officer stationed there for the supervision of the following villages:—Lehal, Sarhal, Mandi, Tahirpur, Aujla, Masani, Chhokran, Rahpa, Turan and Mukandpur.

The disinfection of several of these villages was almost complete before the circle was formed. But having people so much nearer the seat of operations materially helped in getting the work quickly and satisfactorily completed.

During the month of May there were 452 cases and 355 deaths in the infected villages of the Jullundur district, and 235 cases and 126 deaths in the infected villages of the Hoshiarpur district.

In June the village Palewal was found infected and Bahrwal re-infected. With regard to the latter case only one person, a barber's son, was attacked with plague. He and the family were segregated and no further spread took place. But during this season two or three curious isolated cases of what we believe to be a mild form of plague occurred in some of the other villages. Such cases were seen at Bika, Kariha and Laroya. They were all treated as cases of plague, and in no instance was the patient very ill, nor did infection spread to other members.

We mention the fact as probably indicating that the disease had taken on the mild form which has been noticed by others at the beginning or at end of epidemics. We believe these cases require special observation, as, if not promptly recognized and treated, they may be the means of keeping plague extant in a district from one cold weather to the next.

There were 15 cases and 10 deaths during the month of June in the infected villages of the Jullundur district, and 16 cases and 8 deaths in the infected villages of the Hoshiarpur district.

The following villages were declared free of plague during the month :—

JULLUNDUR DISTRICT.

| | | | |
|--------------|------------|----------------|-----------|
| Mehl Gabla, | June 14th. | Hansaron, | June 4th. |
| Masani, | " 12th. | Sirhal Mandi, | " 16th. |
| Katt, | " 2nd. | Dhandhua, | " 20th. |
| Haphowal, | " 7th. | Mukandpur, | " 23rd. |
| Chak Bilga, | " 9th. | Gobindpur, | " 18th. |
| Tahirpur, | " 13th. | Chak Kalal, | " 14th. |
| Mahmudpur, | " 9th. | Punian, | " 27th. |
| Sotran, | " 7th. | Piragpur, | " 25th. |
| Musapur, | " 8th. | Rasulpur, | " 18th. |
| Sodhian, | " 11th. | Rahpa, | " 12th. |
| Lidar Kalan, | " 1st. | Gosal, | " 20th. |
| Khanpur, | " 2nd. | Bhangal, | " 22nd. |
| Bahrwal, | " 2nd. | Bajan, | " 26th. |
| Mazari, | " 17th. | Mallah, | " 24th. |
| Langeri, | " 12th. | Anjla, | " 17th. |
| Chahlan, | " 22nd. | Chhokran, | " 25th. |
| Karnana, | " 18th. | Ladhana Jhika, | " 27th. |
| Bisla, | " 2nd. | Bhaura, | " 29th. |
| Malpur, | " 21st. | Turan, | " 25th. |
| Bika, | " 21st. | | |

HOSHIARPUR DISTRICT.

| | | | |
|----------|------------|-----------|------------|
| Garbi, | June 18th. | Chinkoa, | June 22nd. |
| Kulewal, | " 20th. | Bhagwain, | " 28th. |

In the beginning of July the plague establishment began to be diminished, and a further reduction took place on the 15th. At this time there were only a few villages remaining under treatment, *viz.* Banga, Kariha, Laroya, Pharala, Jhirngar, Bahrwal in the Jullundur district, and Rampur Bilon, Garhshankar and Palewal in the Hoshiarpur district (see Map No. 6). All these villages were declared free during July, and Aur was the only new village.

At the time of writing these notes (August) only one village, Aur, remains on the list. This place was declared infected on July 23rd, when three mild cases of the disease were discovered; a fourth case was found on the 24th.

Kariha and Bahrwal were declared free on July 12th, Laroya on 30th, and Pharala on the 31st of the month.

We shall now take the villages *seriatim* and describe as far as possible the mode of infection in each village. We are indebted to Surgeon-Captain Clark for the notes of the Hoshiarpur villages, to Surgeon-Captain Smith for those in the Nawashahr circle, and Surgeon-Captain Wilkinson for 19 of the 50 villages in the Banga and Upa circles.

It would serve no good purpose to describe in detail the disinfecting operations carried out in each village, as there were in most cases only a repetition of the work done in previous villages. It is, therefore, proposed to refer in this section only to the details in which the arrangements deviated from the usual methods adopted, and to describe these methods more fully in Section III of the Report. This will ensure brevity, with greater clearness of description.

The accompanying chart gives the daily cases and deaths throughout the outbreak, and shows in a graphic form the gradual rise of the epidemic during February, its height in March and April, and its sudden subsidence during the second week in May.

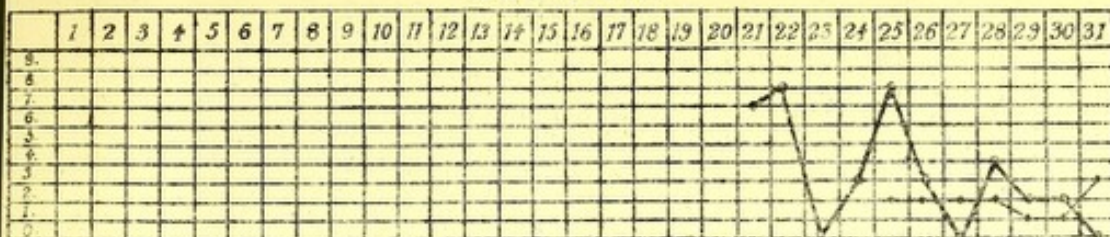
The numbers opposite the names of the following villages indicate their serial order in the accompanying tables, and are given for purposes of ready reference :—

CHART No. I.

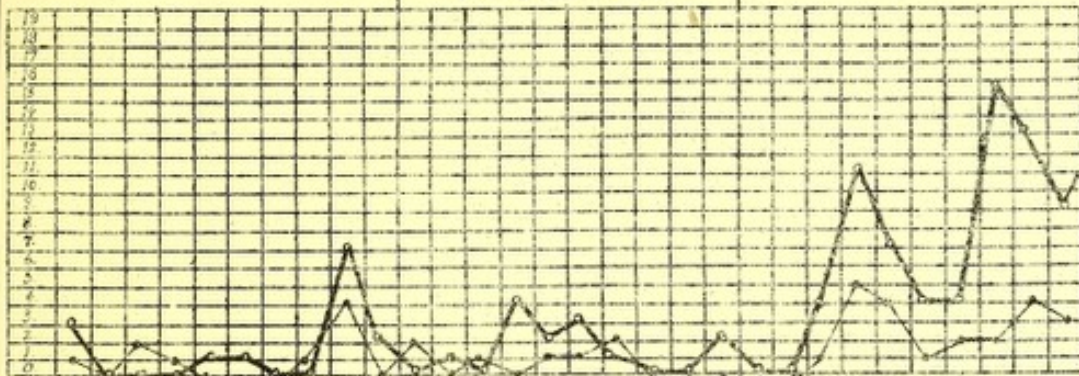
Showing the daily cases and deaths from Plague from Oct. 1897 to July 1898.

-
- The thick black line indicates the cases of plague in the Jullundur district.
 - The thin line, the deaths from plague in the same district.
 - The black dash line indicates the total cases in both the Jullundur and Hoshiarpur districts.
 - The dotted black line, the total deaths in the two districts.
- The figures on the left hand indicate the actual numbers of cases and deaths.

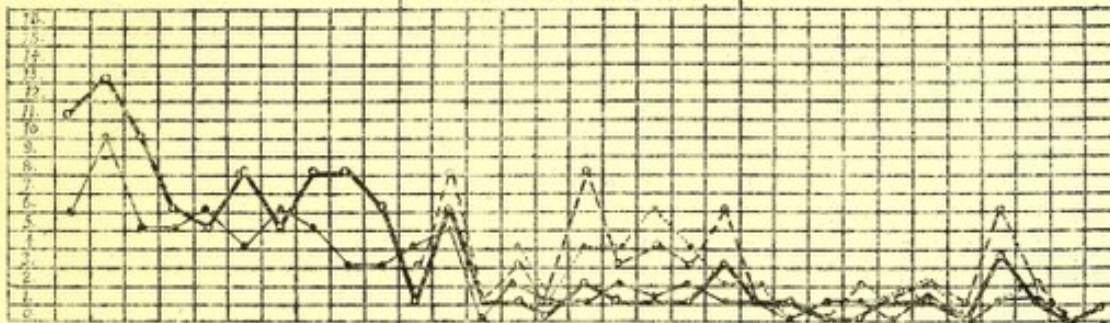
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NOVEMBER.



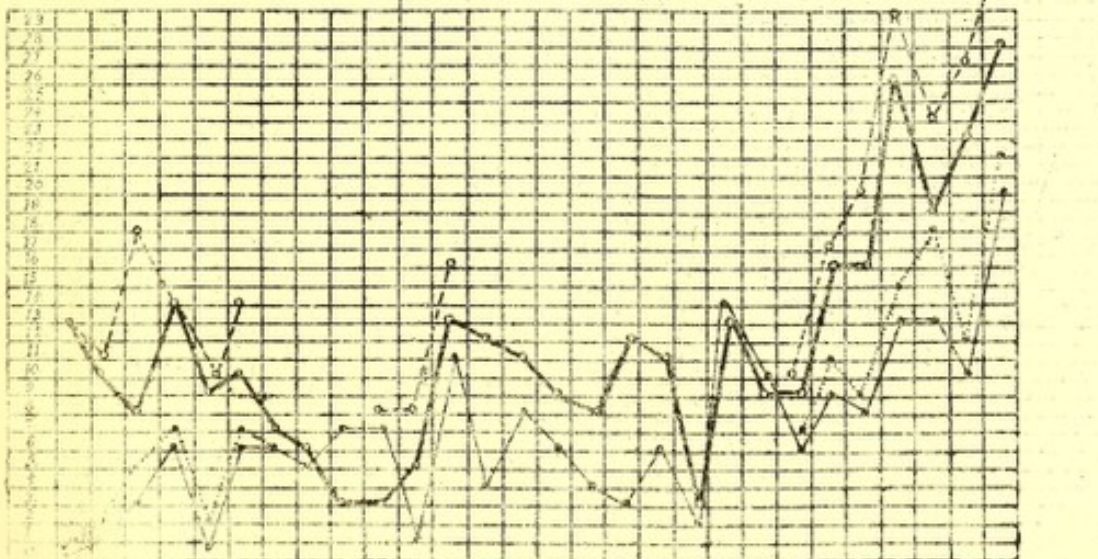
DECEMBER.



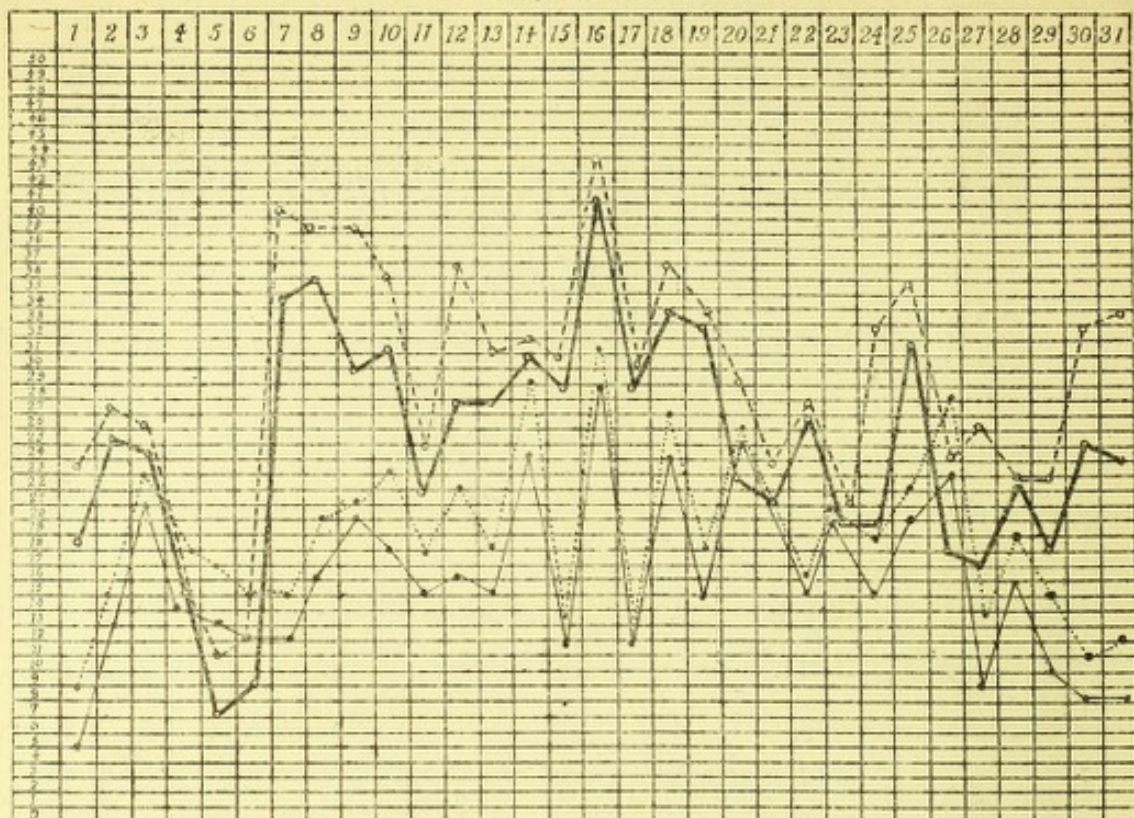
JANUARY.



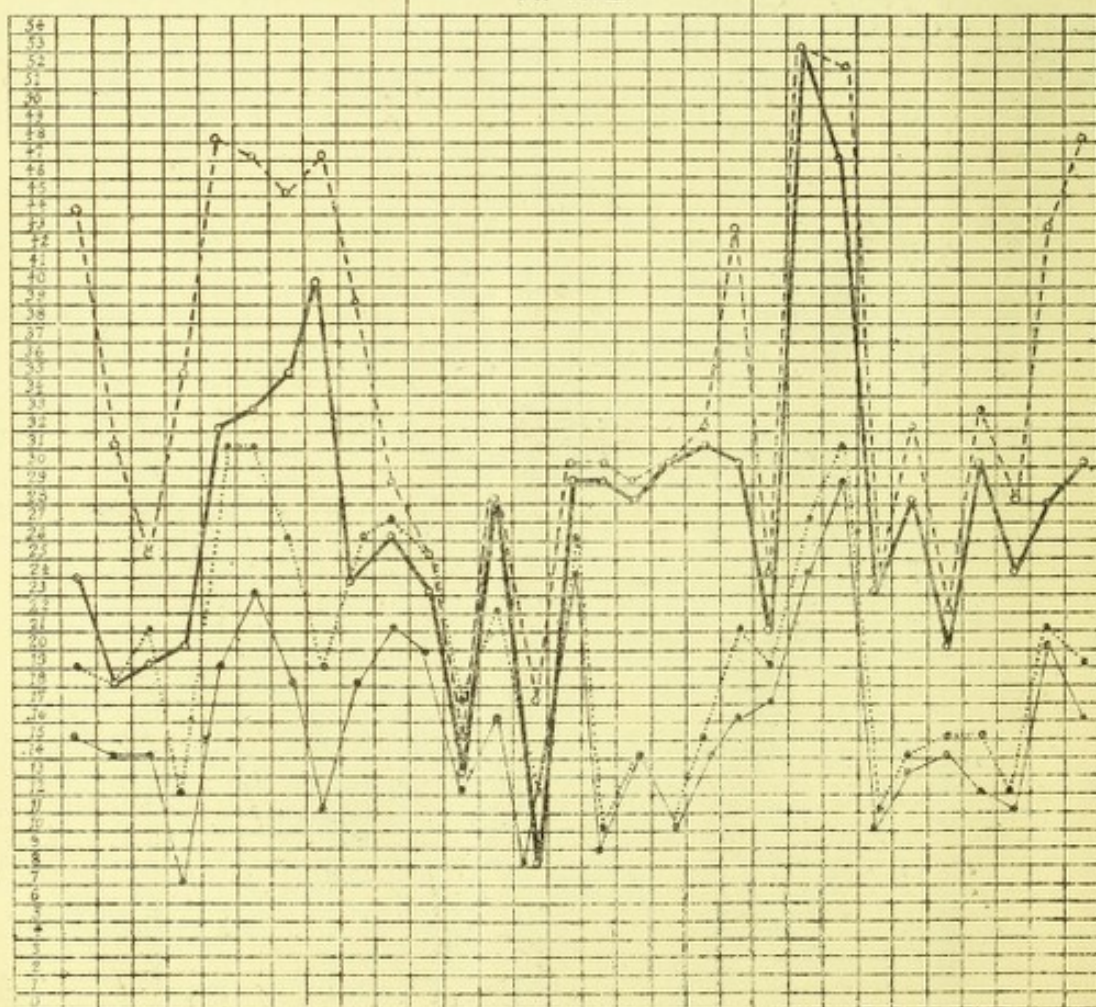
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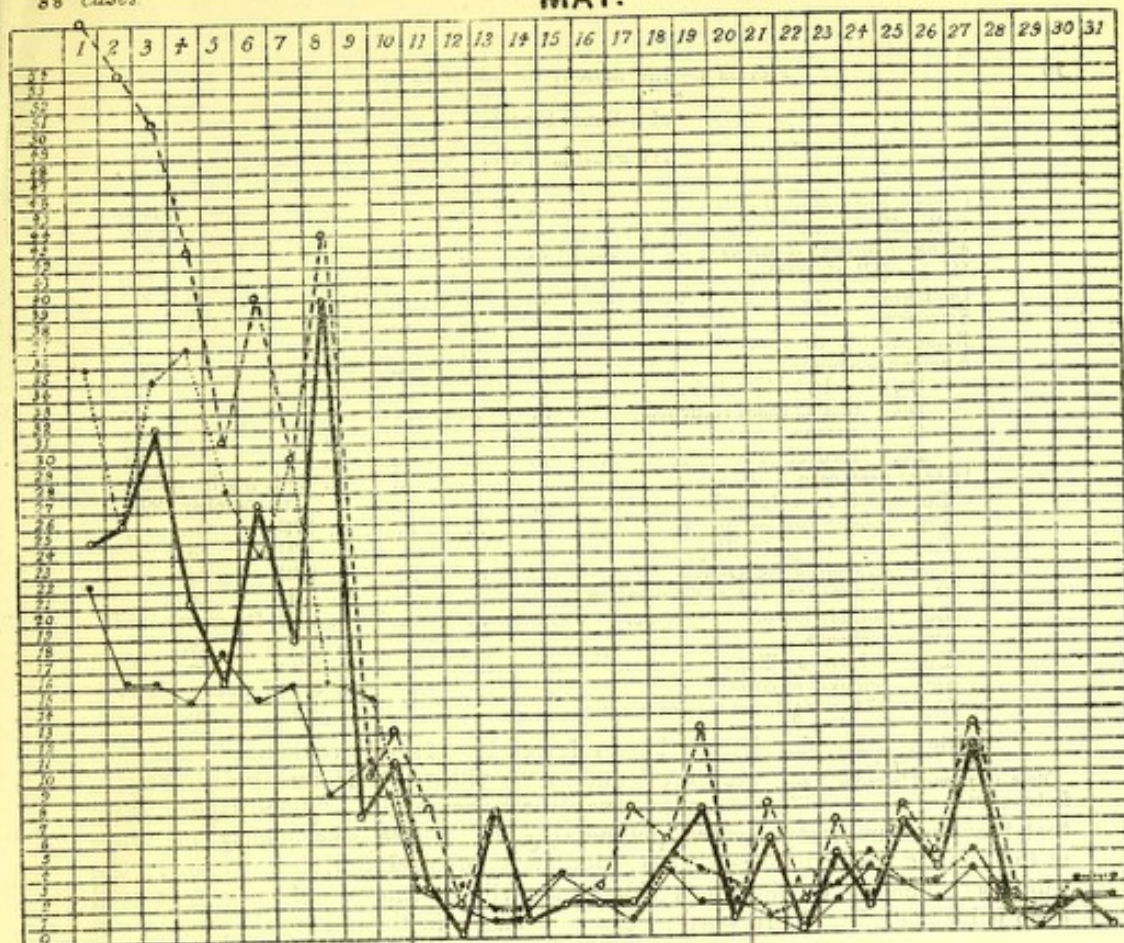
MARCH.



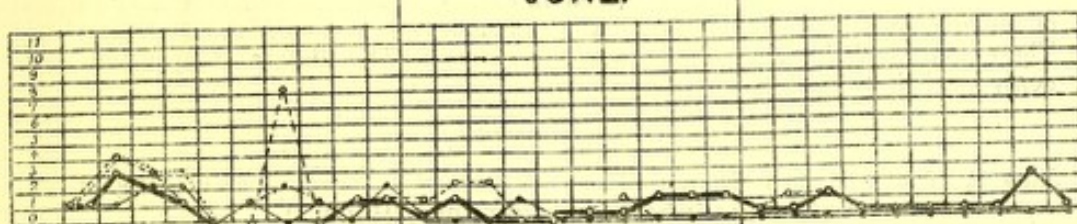
APRIL.



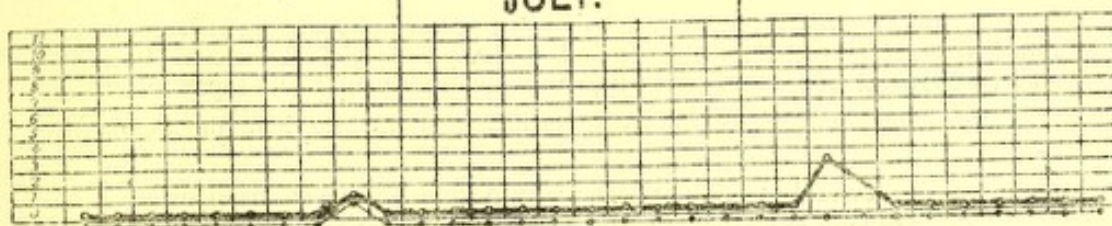
MAY.



JUNE.



JULY.



A.—BANGA CIRCLE.

(1) Khatkar Kalan.

| | |
|--|---------------------|
| Census Population (1891) | 1,400 |
| Roll-call | 1,352 |
| Muhammadans (Rawals) | 244 |
| Hindus (all classes) | 968 |
| Chamars | 129 |
| Sweepers | 11 |
| Ramdasi | ... |
| Number of houses | 300 |
| Do. do. infected | 71 |
| Do. plague cases returned | 79 |
| Do. deaths | 45 |
| Do. recoveries | 34 |
| Date of first case | 29th April 1897. |
| Do. do. returned | 17th October 1897. |
| Do. declaration of plague | 17th do. |
| Do. cordoning of village | 17th do. |
| Do. evacuation of village | 28th do. |
| Do. commencement of disinfection | 25th do. |
| Do. completion of do. | 28th December 1897. |
| Do. last case | 3rd do. |
| Do. return to village | 26th do. |
| Do. removal of cordon | 6th January 1898. |
| Do. village declared free of plague | 6th do. |

This village has already been referred to. It only remains to add that no rats were found in the village itself during disinfection. They seem to have all left previously. The villagers state that they were numerous before plague started. There was plenty of grain in the houses. But live rats were found in a detached outlying portion:—the Pindora which lay on the south side of the village and which was separated from it by a pond. There were no cases of plague in this quarter.

The following is a list of the various camps showing the dates of their formation and the cases which occurred in each. The effect of the evacuation of the quarters was most marked in the Chamars quarters and the sweepers. These were suffering severely the week previously. The disease stopped suddenly on their going into camp.

List of Camps in Khatkar Kalan giving dates of fresh cases of Plague after the inhabitants left the village.

A.—Eleven sweepers went into huts on October 23rd.

They previously had 8 cases of plague, with 6 deaths; one case was attacked afterwards on November 5th. She was a little girl who was in attendance on her mother, who was at the time suffering from plague in a separate hut.

B.—One hundred and thirty-three Chamars went into huts on October 24th.

They previously had 19 attacked with plague. None attacked since.

C.—Six hundred Hindus went into camp on October 26th to 28th.

They had previously not been attacked

There were 2 cases on October 29th.

There was 1 case do. 30th.

Do. 1 do. November 1st.

Do. 1 do. do. 6th.

D.—Two hundred and fifty-seven Rawals (Muhammadans) went into camp on October 26th to 28th.

They had previously no cases of plague.

One case on November 1st.

E.—One hundred and thirty-five Bahrais (Muhammadans) went into camp October 28th.

These had no cases, either before or after evacuation.

F.—One hundred and ninety-two people—the families of 40 persons who had been attacked by plague of various castes—were put into segregation camp on October 28th. Their number was increased by receiving the families of persons attacked in other camps up to November 6th.

One case, October 30th.

One case, November 1st.

(2) and (9) *Jhandher Khurd.*

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 800 |
| Roll-call | ... | ... | ... | ... | ... | 493 |
| Muhammadans | ... | ... | ... | ... | ... | 10 |
| Hindus (all classes) | ... | ... | ... | ... | ... | 336 |
| Chamars | ... | ... | ... | ... | ... | 120 |
| Other castes | ... | ... | ... | ... | ... | 27 |
| Number of houses | ... | ... | ... | ... | ... | 72 |
| Do. do. infected | ... | ... | ... | ... | ... | 12 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 29 |
| Do. deaths do. | ... | ... | ... | ... | ... | 19 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 10 |
| Date of first case | ... | ... | ... | ... | ... | 10th October 1897. |
| Do. do. returned | ... | ... | ... | ... | ... | 9th November 1897. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 9th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 9th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 11th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 13th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 18th December 1897. |
| Do. last case | ... | ... | ... | ... | ... | 18th do. |
| Do. return to village | ... | ... | ... | ... | ... | 19th January 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 29th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 29th do. |

This village has been referred to on page 5.

There is no history of rats in this instance. The people showed little inclination to help in the operations, and many of them refused to take hospital treatment. This was not insisted upon, and it was afterwards found that out of 10 persons who took no medicine 9 died, while out of the remaining 19 only 10 died. It is not presumed by this statement to infer that it was entirely due to the treatment that so many recovered. It was probably partly due to treatment, but mostly due to accident.

The village was re-infected by a Sikh carpenter who ran away from Mullupota when that village was discovered to be infected on February 12th. But when the Mullupota village census was scrutinised, his absence was discovered, and he was traced to Jhandher Khurd, where he was found suffering from plague. As the whole village had recently been thoroughly disinfected, it was thought sufficient to turn out only the household with whom he lived. They were segregated under a police cordon for three weeks; the house disinfected; and when the patient recovered all were thoroughly washed with phenyle lotion and allowed to return to their home. No further spread took place. The village was finally declared free on March 7th.

(3). *KHANKHANAN.*

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 2,300 |
| Roll-call | ... | ... | ... | ... | ... | 2,115 |
| Muhammadans | ... | ... | ... | ... | ... | 324 |
| Hindus all classes | ... | ... | ... | ... | ... | 1,382 |
| Chamars and Ramdasias | ... | ... | ... | ... | ... | 386 |
| Sweepers | ... | ... | ... | ... | ... | 23 |
| Number of houses | ... | ... | ... | ... | ... | 504 |
| Do. do. infected | ... | ... | ... | ... | ... | 120 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 175 |
| Do. deaths | ... | ... | ... | ... | ... | 96 |
| Do. recoveries | ... | ... | ... | ... | ... | 79 |
| Date of first case | ... | ... | ... | ... | ... | 15th October 1897. |
| Do. do. returned | ... | ... | ... | ... | ... | 23rd November 1897. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 23rd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 23rd do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 6th December 1897. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 7th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 5th March 1898. |
| Do. last case | ... | ... | ... | ... | ... | 28th January 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 7th March 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. |

The mode of infection of this village has been discussed on page 6.

The people were placed in camps round the village in the following manner. A large camp was formed at the south, called Dewa Singh's camp, from the Zaildar's name who was nominally the headman in it. It contained 847 people and remained free of disease for over a month. But when the people were allowed to come into the

The plague camps. Infection of people living in camp when they returned to the village to disinfect their houses.

village to disinfect their houses some Tarkhans got infected. It is pretty evident that they got the infection from the village, as though their huts were dotted about the camp, it was found that they all lived in a single lane in the village and their houses were adjacent to each other. This is one of the numerous instances we had of people who when they left the village had their quarters free from disease, but when they returned for disinfection they found them virulently infectious. In consequence of this infection the camp had to be split up into smaller camps. Three so-called healthy camps were formed on the east of the village, and were called Naurang Singh's camp, containing 109 people; Khazan Singh's camp, 314 people; and Dalel Singh's camp, with 112 people.

On the north of the village next to the infected quarters, but separated by half a mile, were the four segregation camps and the hospital.

The Chamars and sweepers (376 in number) had their camp situated to the north-east.

The disease showed some obstinacy, and was finally eradicated by disinfecting nearly all the camps as well as the village. Numerous instances were given by the people of rats dying of plague in houses preparatory to the people living in them becoming attacked. When the village disinfection was completed no rats could be found anywhere, but in the course of a month they returned. The people say these animals went into the fields, during the disinfecting operations.

Notes about rats.

Table No. I.

Showing the Section or Patti of Khankhanan village from which plague cases were admitted to hospital for the fortnight before the people went into camp.

| Patti. | Popula- tion. | NOVEMBER. | | | | | | | | DECEMBER. | | | | | | Total. |
|--------------------------|------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|--------|
| | | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 1 | 2 | 3 | 4 | 5 | 6 | |
| Dalel Singh's Patti ... | 443 | 1 | 9 | 6 | 4 | 3 | 15 | 11 | 8 | 8 | 12 | 8 | 5 | 4 | 5 | 99 |
| Khazan Singh's Patti ... | 314 | ... | 1 | ... | ... | ... | ... | ... | 1 | ... | ... | ... | 1 | ... | 2 | 5 |
| Naurang Singh's Patti... | 109 | ... | 1 | 1 | ... | ... | 1 | 1 | ... | 3 | ... | ... | ... | 1 | 1 | 9 |
| Dewa Singh's Patti ... | 824 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | 1 |
| Exact Patti unknown ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | 1 |
| Total ... | ... | 1 | 11 | 7 | 4 | 3 | 16 | 12 | 9 | 11 | 13 | 9 | 6 | 5 | 8 | 115 |

It will be seen that Dalel Singh's quarter was badly infected, and that the disease was spreading to the other portions of the village. The effect of evacuation is seen in the following table, and needs no comment:—

Table No. II.

Table showing the camps round *Khankhanan* from which cases of *Plague* were admitted to Hospital.

| Serial No. | Name of camp. | Population. | No. of cases in village. | Date of going in to camp. | DECEMBER 1897. | | | | | | | | | | | | JANUARY 1898. | | | | | | | | | | | | REMARKS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Segregation camp No. I | 82 | ... | 6-12-97 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 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Dalal Singh's Patti contained 443 persons, of which 101 went to Dalal Singh's camp and the rest to the segregation camp. All the cases occurring in the segregation camp were among people from Dalal Singh's Patti except one case on 26th December, which came from Naurang Singh's Patti.

(4.) KHATKAR KHURD.

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | 377 |
| Roll-call | ... | ... | ... | ... | 346 |
| Muhammadans | ... | ... | ... | ... | 21 |
| Hindus (all classes) | ... | ... | ... | ... | 182 |
| Chamars and Rahtia Sikhs | ... | ... | ... | ... | 143 |
| Number of houses | ... | ... | ... | ... | 77 |
| Do. infected | ... | ... | ... | ... | 4 |
| Number of plague cases returned | ... | ... | ... | ... | 10 |
| Do. deaths | ... | ... | ... | ... | 6 |
| Do. recoveries | ... | ... | ... | ... | 4 |
| Date of first case | ... | ... | ... | ... | 23rd December 1897. |
| Do. cases returned | ... | ... | ... | ... | 28th do. |
| Do. declaration of plague | ... | ... | ... | ... | 28th do. |
| Do. cordoning of village | ... | ... | ... | ... | 28th do. |
| Do. evacuation of village | ... | ... | ... | ... | 29th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | 3rd January 1898. |
| Do. completion | ... | ... | ... | ... | 31st do. |
| Do. last case | ... | ... | ... | ... | 10th do. |
| Do. return to village | ... | ... | ... | ... | 12th February 1898. |
| Do. removal of cordon | ... | ... | ... | ... | 19th do. |
| Do. village declared free of plague | ... | ... | ... | ... | 19th do. |

This small village has already been mentioned (page 7). The mode of infection is unknown. We got information concerning the presence of the disease very early, and the village was completely evacuated thirty hours afterwards. There were only 10 attacks, of which 6 proved fatal.

There was a re-infection of the village on February 27th (see No. 14, page 24).

(6.) SIRHAL QAZIAN.

| | | | | | |
|--------------------------------------|-----|-----|-----|-----|--------------------|
| Census population (1891) | ... | ... | ... | ... | 2,026 |
| Roll-call | ... | ... | ... | ... | 1,812 |
| Muhammadan, chiefly Arains and Qazis | ... | ... | ... | ... | 677 |
| Hinda Jats | ... | ... | ... | ... | 213 |
| Other Hindus | ... | ... | ... | ... | 439 |
| Chamars | ... | ... | ... | ... | 357 |
| Sweepers | ... | ... | ... | ... | 55 |
| Ramdasis | ... | ... | ... | ... | 72 |
| Number of houses | ... | ... | ... | ... | 625 |
| Do. do. infected | ... | ... | ... | ... | 54 |
| Do. plague cases returned | ... | ... | ... | ... | 82 |
| Do. deaths | ... | ... | ... | ... | 63 |
| Do. recoveries | ... | ... | ... | ... | 19 |
| Date of first case | ... | ... | ... | ... | 25th January 1898. |
| Do. returned | ... | ... | ... | ... | 3rd February 1898. |
| Do. declaration of plague | ... | ... | ... | ... | 3rd do. |
| Do. cordoning of village | ... | ... | ... | ... | 3rd do. |
| Do. evacuation of village | ... | ... | ... | ... | 13th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | 15th do. |
| Do. completion of do. | ... | ... | ... | ... | 8th April 1898. |
| Do. last case | ... | ... | ... | ... | do. |
| Do. return to village | ... | ... | ... | ... | 25th do. |
| Do. removal of cordon | ... | ... | ... | ... | 5th May 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | 5th do. |

Two cases of plague were discovered in the village by Dr. Davidson on February 3rd. The following day 8 more cases were discovered. Attri, the wife of Sonah, a Khatri, seems to have been the first of these cases attacked. The statement given was that she became ill on January 25th. The disease was almost certainly brought from Khankhanan. Many of the inhabitants of the two villages were either related or had close business connections. But we are still ignorant as to who the person was who actually conveyed the infection. One story is that a Jat, named Puran, son of Ram Singh, had relatives in Khankhanan and often went to see them when they were in camp. But Puran Singh was not attacked till February 19th, which was long after the disease had established itself in his village. Another story is that Labhu, a Tarkhan, who died at Sirhal Qazian on February 4th, brought the disease from Khankhanan. This seems likely from the fact that he did the same kind of woodwork for which the Khankhanan carpenters are so famous, and these latter suffered severely in the epidemic.

The cases discovered by us were all in the northern portion of the town and consisted of Khatri 2, Arains 3, Suniars 3, 1 Lalari and 1 Tarkhan. Arrangements were at once commenced for the total evacuation of the village.

The infected houses were immediately emptied and their inhabitants placed in a segregation camp. The large Chappar hospital from Khankhanan was taken down and brought over to Sirhal Qazian. The patients who had been accommodated in small huts were admitted into the hospital on February 8th. There was some delay in getting out the rest of the village, consisting of 1,812 persons, on account of the material for building huts having run short. But in spite of this the village was evacuated by the 13th of the month. Up to this time 25 patients had been attacked, all of whom, except 1 from the segregation camp, came from the village.

After the people came out very heavy rain fell, and they consequently suffered a good deal of discomfort. There was a very determined attempt to hide cases even after the villagers went out into camp. This was evinced by the fact that no less than 12 cases were picked out dead from the various camps.

The disease at first was very obstinate, and the improvement from evacuation small; but it quickly disappeared when the weather again became fine.

The following is a list of the cases from the various camps:—Segregation camp 15 cases; Dewa Singh's camp 14; Chamars 9; Ram Singh's, where the disease started, 8; Arains 6; Qazians 2; and 2 sweepers. There were also two policemen attacked. The means by which these latter were infected was not discovered.

The last case occurred on March 8th, and the disinfecting was completed on April 8th. The people returned to their homes on the 25th, having been two months and ten days in camp. The mortality among those attacked was very high, being 63 deaths out of 82 cases, or a death-rate of 76·8 per cent. The type of disease in this place was very virulent. In one case a man died a few hours (18) after being attacked.

(7). MALLUPOTA.

| | |
|--|---------------------|
| Census population (1891) | 1,399 |
| Roll-call | 1,174 |
| Muhammadans, chiefly Arains | 318 |
| Hindus, chiefly Jats | 659 |
| Chamars | 178 |
| Sweepers | 19 |
| Number of houses | 304 |
| Do. do. infected | 70 |
| Do. plague cases returned | 91 |
| Do. deaths returned | 60 |
| Do. recoveries returned | 31 |
| Date of first case | January 28th. |
| Do. do. returned | 12th February 1898. |
| Do. declaration of plague | 12th do. |
| Do. cordoning of village | 12th do. |
| Do. evacuation of village | 21st do. |
| Do. commencement of disinfection | 28th do. |
| Do. completion of do. | 20th April 1898. |
| Do. last case | 24th March 1898. |
| Do. return to village | 3rd May 1898. |
| Do. removal of cordon | 13th do. |
| Do. village declared free of plague | 13th do. |

This large village, consisting of 1,174 people, is situated about two miles north of Khankhanan, and the fields of the two villages adjoin one another along the intervening boundary. The disease was discovered here by Dr. Davidson on February 12th, when no less than 9 cases were found by the medical officers on the same day. The mode of infection of this village is interesting. It apparently did not take place from any of the adjoining infected villages, but from one situated eight miles away. About 15 days before our visit, one of the lambardars, named Hamera, went to Nawashahr in order to make some arrangements about the land tax. His daughter-in-law, Nihali, went with him. On their return journey they went a little out of the way to visit some of Nihali's relatives at Shikohpur. This must have been just before this latter village was cordoned by us on January 29th. The two travellers seemed to have stopped the night and then proceeded on their homeward journey. On arriving at a village named Dosanjh, five miles distant, Hamera suddenly became ill and had to be carried the rest of the way to Mallupota. On arriving at his home he took to his bed and died a few days later. After arriving at the house, Nihali

became ill and died the same day as her father-in-law. On our arrival at the village Phatu, one of Hamera's sons, was down with plague. The family denied that Hamera and Nihali ever went to Shikohpur, but the story was afterwards confirmed by other relatives, and besides it is difficult to see what Hamera was doing at Dosanjh, which is not on the direct road to Nawashahr, while it is on the direct line to Shikohpur, and also what was Nihali's object in going with her father-in-law if it was not to see her relatives at Shikohpur. The result of this visit was most disastrous, as not only was the disease introduced to Mallupota on account of it, but this family was the cause of spreading the disease to another village Mehlghahla (*vide infra*). It appears that when Nihali was very ill her daughter Shib Dai, who had married Uttam Singh's son at Mehlghahla, came to see her, and eventually got ill at the latter place.

On our arrival the village, now under consideration, was found badly infected. As previously stated, nine cases were found on that day, and five cases on each of the three following days. It was impossible to get out the people into camp quickly, as there were heavy winter rains at the time and Mallupota, being situated on low-lying ground, was almost surrounded by a lake. In fact, on the 14th the segregation camp was half under water. In consequence of this, it took nine days to evacuate the village, and by that time 43 cases had occurred, giving an average of nearly 5 cases a day. The beneficial result of the evacuation was not apparent for some days (see Table No. IV, page 118), there being 5 cases on the 23rd, 4 on the 24th, and 8 on the 25th, and again 4 on the 26th: after this the disease showed signs of abating. On March 2nd (nine days after evacuation) there were only 2 cases. The number of cases after evacuation was 48 as against 43 before evacuation, giving averages of 4.0 and 3.6, respectively. The comparison is not a fair one, as most of the cases occurring after evacuation must have been infected in the village, but only showed symptoms when in camp. The disease then seemed to have stopped. But unfortunately some Chamars got infected when on disinfection work in the village, and spread the disease in their camp. This was promptly taken in hand by Dr. Fatteh Chand, who disinfected the camp and moved it to a fresh site. After this the disease stopped. The practical ending of the epidemic was March 18th, but the usual last "dropping case" took place on March 24th, thirty-one days after total evacuation of the village.

The disinfection was completed on April 20th, and the people returned to the village on the 3rd May, having been one month and ten days in camp. They had 91 cases, with 30 deaths, being an average of 7.75 per cent. of the population attacked, of which 33 per cent. died.

The lambardars of this village were tried for having knowingly hidden the occurrence of the disease, and were each sentenced to three months' imprisonment.

(11). MEHLGAHLA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|--------------------|-------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 2,548 |
| Roll-call | ... | ... | ... | ... | ... | ... | 2,488 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 192 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 1,914 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 307 |
| Sweepers | ... | ... | ... | ... | ... | ... | 75 |
| Number of houses | ... | ... | ... | ... | ... | ... | 926 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 60 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 101 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 57 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 44 |
| Date of first case | ... | ... | ... | ... | ... | 22nd February 1898 | |
| Do. do. returned | ... | ... | ... | ... | ... | 23rd do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 23rd do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 23rd do. | |
| Do. evacuation of village | ... | ... | ... | ... | ... | 17th March 1898 | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 23rd do. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 20th May 1898 | |
| Do. last case | ... | ... | ... | ... | ... | 3rd do. | |
| Do. return to village | ... | ... | ... | ... | ... | 4th June 1898 | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 10th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 14th do. | |

Mehlghahla is one of the most instructive villages with which we have had to deal. There seems little doubt that we obtained very early information

about it, and although energetic measures were immediately taken the inhabitants suffered severely.

Among the people who were found to have left Mallupota when that village was found infected was a girl named Shiv Dai daughter of Nathu, and grand-daughter of Hamera, the lambardar who was first attacked at Mallupota. The statement of several people is that when Nathu's wife Nihali died at Mallupota, Shiv Dai, her daughter, who was married to a youth named Jawala at Mehlgahla came over to see her mother and remained three days at Mallupota. She left just previous to the village being cordoned on February 12th and remained well till February 22nd. We were able to trace her to her destination, and Dr. Davidson, who was then inspecting officer, paid several visits to Mehlgahla to satisfy himself that she was quite well. On the date named above, Shiv Dai complained of fever and pain and swelling in the groin. Her father-in-law, Uttam Singh, in whose house she was now living, immediately gave information to Dr. Davidson, who after seeing the girl informed the executive staff.

The following day, February 23rd, Uttam Singh and the whole of his family including the patient were put out into a suitable camp some distance from the village and remained there till March 17th, when they went into a newly formed health camp. A few days after Shiv Dai's attack, Uttam Singh's house was thoroughly disinfected and white-washed by a trained gang from Khankhanan, it being considered inadvisable to employ any of the Chamars belonging to the village itself.

Between February 22nd and March 15th (twenty-one days) no new cases occurred, and it seemed as if the disease had been nipped in the bud. Shiv Dai made a rapid and uneventful recovery and the whole family with all their personal property were washed in phenyle solution preparatory to allowing them to return to the village.

On the latter date, however, our hopes were dashed to the ground. One of the lambardars arrived late at night at our camp and reported that several of the Chamars and sweepers in the Chamars' quarters had been attacked, the first attacked being the *hamin* or servant of Uttam Singh.

The following day the evacuation of the whole village, of 2,488 persons, was commenced, the Chamars being given a separate camp from the others. A brisk epidemic broke out among the latter, 25 of whom were attacked, mostly from the segregation camp.

The evacuation was completed on March 17th, and the disease stopped on the 24th, seven days later. Up to this time only Chamars had suffered, excluding the girl who introduced the disease.

On March 23rd the systematic disinfection of the village was commenced. The "infected" houses in the Chamars' and sweepers' quarters were first done, and it is important to note that none of the persons employed on the disinfection of these houses was attacked with plague.

The work was completed on the 28th. The cleaning of the "healthy" houses was then commenced.

On April 2nd more cases began to occur among the disinfecting gang, and on the 4th a Muhammadan bhisti from the "healthy camp" was attacked.

At this time it was almost impossible to obtain coolie hire, as the crops were ripe and it was of importance to the zamindars that their grain should be gathered with the utmost speed. They, therefore, employed every available workman in the village. We were consequently obliged to allow house-owners to do their own disinfecting and whitewashing under the supervision of a European sanitary inspector. Large numbers of rats were found dead all over the village, and people working at the disinfection were frequently attacked.

The disease got into the large so-called "healthy camp," and although disinfection of all the clothes and personal property and giving a phenyle bath to every person was started immediately, it was found that, on account of the large size of the camp, this took some time to accomplish. In fact, we did not wait for the work to finish, but broke up the large camp into four smaller ones.

This was completed on April 23rd.

On April 22nd, on account of the large number of casualties among the people on disinfection work, we suspended the work altogether. The day previously, Mr. Goulbourne, the European sanitary inspector, was attacked with plague. He died three days later. Nine persons were attacked on April 22nd and 13 on the 23rd. There were then two or three cases daily till the 27th (five days after stopping the disinfection). The disease then stopped, with the exception of one dropping case on May 3rd.

The patti where most people were attacked among the disinfectors was one which was at the extreme north-east corner of the village, while the Chamars' quarters, where the cases of plague had occurred before evacuation, was situated at the south-west corner. *The infection had, therefore, travelled the whole breadth of this large village after all the people had left it.* No dead rats were seen before evacuation; they were found all over the village after the place had been emptied, and in one room alone 15 dead rats were found. They could not have died of starvation, as a large quantity of grain was left in the village and was easily accessible.

In May we completed the disinfection with a properly constituted gang of coolies supervised by two well-trained Hospital Assistants. As we were not satisfied with the previous disinfecting, and also bearing in mind what a very strong focus of infection the village had been, we had the entire village re-disinfected. No casualties occurred during the second disinfection, and no rats, dead or alive, were found.

The people began to return to their homes on June 4th, having been two months and eighteen days in camp.

They had 101 cases of plague, with 57 deaths, being a percentage of 4.05 cases to population and 56.43 deaths to attacks.

The following is a table of the "daily state," from the beginning to the end of the epidemic in Mehlgahla:—

Table No. 3.

| | | February. | | | | | | | March. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|--------|----------------|-----|-----|-----|-----|-----|-----|-------------------|-----|-----|-----|-----|-----|-----|--------------------------|-----|-----|-----|----------------------------------|-----|----|----|----|-----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|
| Date. | Cases. | 23 | 24 | 25 | 26 | 27 | 28 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | |
| | | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7 | 2 | 6 | ... | 1 | 2 | 1 | 1 | 2 | 1 | 2 | ... | ... | ... | ... | ... |
| | | Imported case. | | | | | | | Chamars attacked. | | | | | | | Total village evacuated. | | | | Disinfection of infected houses. | | | | | | | | | | | | | | | | | |

| | | April. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | May. | | | | |
|-------|--------|---|-----|-----|---|---|----------------------------------|---|---|---|---|-----------------------------------|----|-----|---|-----|----|----|-----|----------------------------------|-----|----|----|----|------------|----|----|----|----|----|----|------|-----|-----|-----|---|
| Date. | Cases. | 30 | 31 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 1 | 2 | 3 |
| | | ... | ... | ... | 2 | 2 | 4 | 8 | 1 | 1 | 2 | 1 | 3 | ... | 3 | ... | 2 | 1 | ... | ... | ... | 3 | 6 | 6 | ... | 9 | 13 | 2 | 3 | 2 | 1 | ... | ... | ... | ... | 1 |
| | | Disinfection of Chamars' and sweepers quarters completed. | | | | | Uttam Singh's Patti disinfected. | | | | | Jaimal Singh's Patti disinfected. | | | Sundar Singh's, Nihal's and Gurditta's Patis disinfected. | | | | | Disinfection entirely suspended. | | | | | Last case. | | | | | | | | | | | |

(14). KHATKAR KHURD. (Second infection).

| | | | | | | | |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 377 |
| Roll-call | ... | ... | ... | ... | ... | ... | 346 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 21 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 182 |
| Chamars and Rabtia Sikhs | ... | ... | ... | ... | ... | ... | 143 |
| Number of houses | ... | ... | ... | ... | ... | ... | 77 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 1 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 3 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 2 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 1 |

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Date of first case | ... | ... | ... | ... | ... | 27th February 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 28th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 28th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 28th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 28th do. |
| Do. last case | ... | ... | ... | ... | ... | 19th March 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 7th April 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. |

(See also No. 4, page 7).

This little village, which had been evacuated and disinfected on account of plague in December and January, and had been declared free of the disease on the 22nd February, gave another case on the 27th. No case had occurred since January 10th, and the people had been living in their houses fifteen days when this case occurred. It will be remembered that they had only 10 cases, but 6 of these had died. All those attacked had been Jat Sikhs.

On February 27th, a Chamar woman named Dharmua, wife of Deala, was attacked in the Chamars' quarters at the opposite end of the village and died early on the morning of the 28th. This woman's husband earned his living by cutting grass and selling it in Banga bazaar. His wife usually accompanied him. It is, therefore, extremely likely that this woman got the disease elsewhere and not from the village itself. However, the two families occupying the same court-yard were placed in camp.

Two others were attacked, one being the other wife of Deala.

Two out of the 3 cases proved fatal.

The evacuated quarters only were disinfected and whitewashed.

The people in camp returned to their homes on April 7th.

(17). BALON.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 282 |
| Roll-call | ... | ... | ... | ... | ... | 189 |
| Muhammadans, chiefly Gujars | ... | ... | ... | ... | ... | 161 |
| Chamars | ... | ... | ... | ... | ... | 28 |
| Number of houses | ... | ... | ... | ... | ... | 48 |
| Do. do. infected | ... | ... | ... | ... | ... | 16 |
| Number of plague cases returned | ... | ... | ... | ... | ... | 28 |
| Do. deaths returned | ... | ... | ... | ... | ... | 11 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 17 |
| Date of first case | ... | ... | ... | ... | ... | 24th February 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 2nd March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 2nd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 2nd do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 4th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 8th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 20th April 1898. |
| Do. last case | ... | ... | ... | ... | ... | 2nd do. |
| Do. return to village | ... | ... | ... | ... | ... | 24th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 4th do. |

This is a little village consisting of about 50 houses, situated at the northern limit of the Banga circle and bordering on the Hoshiarpur district; it is inhabited almost entirely by Muhammadan Gujars, 161 in number.

The mode of infection was as follows:—Umer Din's wife, who was the first person attacked, had been an inhabitant of Purkhowal, a village in the Hoshiarpur district. She had been to this village to see her brother Dalel, son of Sakru, and returned on or about February 16th. Eight days later she became ill with high fever and delirium and died three days later, that is on February 24th. As it is the custom among natives to give presents of clothes, &c., to the daughters of the house when they return from their husband's houses to visit their homes, the people of Balon seem to have no doubt that Umer Din's wife conformed with custom and brought clothes from her home. But we were never able to find these, and the family stoutly denied that she had ever brought them.

It appears that another girl named Hafiz, daughter of Bassan, also went to Purkhowal and was attacked with plague on her return, about February 27th. But as this was subsequent to the last case, it can only be looked on as a second possible source of infection.

The village was discovered on February 23th, and entirely evacuated on March 4th. There were only 4 infected houses before the people went out, and these were at once disinfected, ventilated and limewashed. Twenty-eight people in all were attacked, only 11 of whom succumbed. The houses of people attacked in camp were, however, looked on as infected.

Among those attacked were 2 of the disinfecting gang who were infected while working in the village. As usual, it was not from the so-called "infected" houses that they got their disease, but from houses supposed to be free from all taint. The last case occurred on 2nd April, twenty-nine days after evacuation.

The people returned to their village on the 24th April, after having spent one month and twenty days in camp.

(18). LAKHPUR.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 445 |
| Roll-call | ... | ... | ... | ... | ... | ... | 417 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 172 |
| Hindus (all classes) | ... | ... | ... | ... | ... | ... | 324 |
| Chamars and sweepers | ... | ... | ... | ... | ... | ... | 71 |
| Sahnsis | ... | ... | ... | ... | ... | ... | 22 |
| Number of houses | ... | ... | ... | ... | ... | ... | 85 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 18 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 31 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 23 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 8 |
| Date of 1st case | ... | ... | ... | ... | ... | ... | 1st March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 5th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 5th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 5th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 16th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 26th March 1898. |
| Do. returned to village | ... | ... | ... | ... | ... | ... | 5th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 15th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 15th do. |

Lakhpur is a small Jat village situated on the north-west boundary of Khankhanan. The first case of plague seen was Maji, the son of Gaura. The boy had been ill four days when seen and died on the day of our visit (March 5th). The only history of the introduction of the disease which we could obtain was that Bhola, the boy's uncle, with whom he lived, had been in the habit of going to Khankhanan when the cordon was on that village to *salaam* to the *zaildar*. It seems probable that, somehow or other, he introduced the disease.

At first only Bhola's family was put out into camp. But on March 12th more cases were found in the village. In consequence of this the whole village was evacuated. This was completed on March 14th.

Thirty-one people in all were attacked in a village of 417 persons, and 23 died, giving a mortality of 74.2 per cent., which is higher than the average.

The sick from this place were treated in the Mullupota hospital, situated only about a mile and a half away. The last case occurred on 26th March, 12 days after evacuation, and the villagers returned to their homes on May 5th, having been fifty-two days in camp.

(19). NURPUR.

| | | | | | | | |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 443 |
| Roll-call | ... | ... | ... | ... | ... | ... | 483 |
| Muhammadans, chiefly Gujars | ... | ... | ... | ... | ... | ... | 68 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 90 |
| Sikhs | ... | ... | ... | ... | ... | ... | 252 |
| Chamars | ... | ... | ... | ... | ... | ... | 73 |
| Sweepers | ... | ... | ... | ... | ... | ... | ... |
| Ramdasis | ... | ... | ... | ... | ... | ... | 20 |
| Number of houses | ... | ... | ... | ... | ... | ... | 106 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 6 |
| Number of plague cases returned | ... | ... | ... | ... | ... | ... | 19 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 11 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 8 |

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Date of first case | ... | ... | ... | ... | ... | 26th February 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 7th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 7th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 7th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 9th do. |
| Do. last case | ... | ... | ... | ... | ... | 15th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 3rd May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 13th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 13th do. |

Nurpur is situated a short distance—not half a mile—from Sirhal Qazian, and when the latter village got infected it seemed probable that this one would also, sooner or later become attacked. This took place about the end of February, and the disease was discovered on the 7th of the next month. There seems to have been a double source of infection from two separate villages, as has happened in several other plague-infected villages. The first person to be attacked was Harnam Singh, son of Uttam Singh, a Jat, aged 18 years. He became ill on February 28th and died on the 7th. Harnam Singh's sister had married an obstructive old man named Sunder Singh, who was well known to us and who died of plague at Khankhanan on December 5th. It appears that after this both Harnam Singh and his father, Uttam Singh, often visited Khankhanan, and even took articles of food, &c., with them from Sirhal Qazian, the village next to their own. The villagers believe that these men brought the infection from Khankhanan. If this is the case, it is difficult to understand how there could be such a long interval between getting the infection and the attack of Harnam Singh. The last case in the segregation camp, where Sunder Singh's wife lived, was January 9th, while the last case at Khankhanan was the 28th of the same month, and Harnam Singh was not attacked till February 28th. It is impossible to suppose that the incubation of this disease was 30 days. The only plausible suppositions are that either Harnam Singh did not get his infection from Khankhanan, or if he did, it must have been through the medium of some sort of formites such as clothes, &c., which under favouring circumstances can keep the germs of the disease alive for an indefinite period. Without having any proof of this transference of clothes, we rather incline to the belief that this was the probable mode of infection.

The second source of infection, though a little later in date, is much more definite. When Sirhal Qazian, the adjacent village, was evacuated on account of plague on February 13th, coolies were employed in putting up the huts which the plague authorities had provided for the people. Among these were several Chamars belonging to the village now under consideration. Biru, son of Rahru, was one of these, and it is definitely known that he helped in the putting up of the Arains' camp, where, as we have already shown, 6 cases of plague occurred. Several Arains were attacked in the village, and on the 16th and 17th, Arains dead of plague were found in the camp. So there is little doubt that Biru mixed with plague-infected people. He was also related, as were many of the Chamars of Nurpur, with Chamars of Sirhal Qazian, and it was these relatives who got them to come in and help in the work. The plague officers believing that all the Chamars on work at the various camps were people of the village, did not use any means to keep them separate. The Chamars worked in the camps even after the people came out. Biru went home to Nurpur, got ill on the 2nd or 3rd March, and gave the disease to three members of his family and thus started the epidemic in the Chamars quarters; another Chamar named Ralla was known to have worked in the Sirhal Qazian camp up to March 2nd. In Nurpur 19 people were ultimately attacked, of whom 14 were Chamars.

There were 11 deaths, giving a percentage of 3.93 of the population attacked, with a mortality of 58.8.

The village was evacuated on March 9th; the last case occurred on the 15th and the people returned on May 3rd, so that they were not in camp more than fifty-five days.

(21). SAHL KALAN.

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | 356 |
| Roll-call | ... | ... | ... | ... | ... | 236 |
| Muhammadans, chiefly Arains | ... | ... | ... | ... | ... | 191 |
| Hindus | ... | ... | ... | ... | ... | 14 |

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|-----|
| Chamars | ... | ... | ... | ... | ... | ... | 31 |
| Number of houses | ... | ... | ... | ... | ... | ... | 52 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | ... |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 12 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 10 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 2 |
| Date of first case | ... | ... | ... | ... | ... | 24th February 1898. | |
| Do. do. returned | ... | ... | ... | ... | ... | 8th March 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 8th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 8th do. | |
| Do. evacuation of village | ... | ... | ... | ... | ... | 15th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 20th do. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 20th April 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 26th March 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 27th April 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 5th May 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 5th do. | |

This small village was infected from Birampur, in the Hoshiarpur district. Two brothers, named Gujar and Munshi, Jhinwars or Hindu water-carriers, were in the habit of going to Birampur to visit their maternal uncles, Ralla and Uttam. On one occasion, on their return to Sahi Kalan, Gujar fell ill, and after an illness of two days, died. This happened some days before we knew that the village was infected. Munshi, who went with his brother to Birampur, brought some clothes back with him, and was attacked later, on March 2nd, or eight days after his return to his home. It was while he was ill that the Jhinwar youth Puran from Gobindpur came to see him, and afterwards spread the disease in his own village. In the meantime his uncle, Jowahir, whom he had been to see, died at Birampur from plague.

The existence of the disease at Sahi Kalan was discovered by Dr. Davidson on March 8th. Munshi died on the 10th. A partial evacuation of the village was at first attempted, with the usual result, that it failed. On the 15th the whole village was emptied.

There were only 12 attacks in this village, not including Gujar, the existence of whose illness and death did not transpire till the village was re-occupied. Ten cases proved fatal, giving a mortality of 83·3 per cent. This is, therefore, one of the villages where we had a very small number of attacks, but the mortality was one of the highest. The people were treated in the Balon hospital, where the percentage of deaths among the other occupants was very low.

The last case occurred on March 26th, ten days after the evacuation. The village was re-occupied on 25th April. None of the disinfecting gang were attacked.

(23). NAURA.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,688 |
| Roll-call | ... | ... | ... | ... | ... | 1,567 |
| Muhammadans | ... | ... | ... | ... | ... | 270 |
| Hindus, chiefly Sainis | ... | ... | ... | ... | ... | 1,065 |
| Chamars | ... | ... | ... | ... | ... | 190 |
| Sweepers | ... | ... | ... | ... | ... | 42 |
| Number of houses | ... | ... | ... | ... | ... | 391 |
| Do. do. infected | ... | ... | ... | ... | ... | 1 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 1 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... |
| Do. recoveries returned | ... | ... | ... | ... | ... | 1 |
| Date of first case | ... | ... | ... | ... | ... | 5th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 10th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 10th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 10th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 10th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 28th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 29th do. |
| Do. last case | ... | ... | ... | ... | ... | 10th do. |
| Do. return to village | ... | ... | ... | ... | ... | 3rd April 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 13th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 13th do. |

Only one case of plague occurred in this village. The case was an old Jhinwar woman named Nihali, widow of Nathu, who was discovered to be ill on March 10th. She had a large suppurating bubo in the groin, and appeared to be very ill indeed. She stated that

Only one case.

she had been ill only five days, but from the condition of the bubo and the general aspect of the patient the medical officer decided that probably she had been ill a much longer period. She was moved out into camp and ultimately recovered.

The place where she lived was a room leading out of a covered passage into a small court-yard. All the houses in this enclosure were evacuated, and the people, 18 in number, placed in camp.

As no fresh cases occurred the segregated people were disinfected and allowed to return to their houses on April 3rd. The houses themselves had been treated *secundem artem* a fortnight previously.

This is the only village out of many in our circle in which the experiment of partial evacuation succeeded in checking the disease.

The mode of infection is obscure. The only history we were able to obtain as to the cause of this case being attacked was that the woman is said to have been in the habit of going to the camp where Uttam Singh's family were segregated outside Mehlgahla, the next village, in order to comb out Uttam Singh's wife's hair. It will be remembered that Uttam Singh's daughter-in-law ran away from Mallupota and was taken ill at Mehlgahla, and that at first only this family with the patient were placed in camp. The story of Nihali being infected from these people seemed to us to be a very likely one, especially as Uttam Singh's camp is really nearer to Naura than to Mehlgahla in point of distance, and also the police guard set over it patrolled the Mehlgahla side and not the Naura side, and Uttam Singh's wife had no other woman to help her in her toilet except the sick girl between February 23rd, when she went out into camp, and March 5th, when the old Jhinwari was said to be attacked. However, without further proof the story cannot be accepted, as it was given by one of the lambardars of Mehlgahla, who was always very hostile to Uttam Singh, and, moreover, from numerous inquiries we were unable to get any confirmation to the story.

(25). BANGA.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 5,010 |
| Roll-call | ... | ... | ... | ... | ... | 4,727 |
| Muhammadans | ... | ... | ... | ... | ... | 761 |
| Hindus, chiefly Brahmins and Khatri | ... | ... | ... | ... | ... | 3,221 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | 569 |
| Sweepers | ... | ... | ... | ... | ... | 176 |
| Number of houses | ... | ... | ... | ... | ... | 1,630 |
| Do. do. infected | ... | ... | ... | ... | ... | 80 |
| Number of plague cases returned | ... | ... | ... | ... | ... | 103 |
| Do. deaths returned | ... | ... | ... | ... | ... | 65 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 38 |
| Date of first case | ... | ... | ... | ... | ... | 7th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 11th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 11th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 11th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 30th April 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 11th March 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 28th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 20th do. |
| Do. return to village | ... | ... | ... | ... | ... | 29th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 5th July 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 9th do. |

It had long been feared that Banga would sooner or later become infected, and to guard against this, measures were taken as early as December last in order to try and keep out the disease. A carefully prepared list of the inhabitants was made, the Hospital Assistant in charge of the local dispensary was warned to be on the alert and to give early information, and the burying and burning grounds were carefully watched. The inhabitants were warned not to allow strangers to stop in the town more than was absolutely necessary. This was a difficult measure to carry out, as Banga is the central market for the surrounding villages. It is here that the cultivators bring their vegetables, &c., for sale, and take back salt, *ghi* and other necessities for their homes. The bankers and large shop-keepers have their head-quarters and stores in the bazaar. It was also the place from which the police on plague duty drew their supplies.

On December 30th a Committee, consisting of Bishen Dass, the President of the Municipal Committee, Sham Singh, Zaildar of Banga, Sekunder Khan, Zaildar of Heon, Muhammad Bakhsh, Thanadar, and Ghulam Rasul, Hospital Assistant, was formed in order to make daily visits throughout the town, report all suspicious cases of illness, see that drains, &c., were kept clean, houses in a dirty state properly remedied, ventilation holes made in any houses which were dark or overcrowded, and to put down phenyle solution wherever they thought it desirable. The Committee worked with energy, and afterwards, with the help of a nurse, did very good inspection work. At the time there was an epidemic of mumps in the town which caused them anxiety several times, as the disease in its early stages sometimes resembles plague.

The first case of the real disease was discovered on March 11th. It was an old woman named Rajji, a Jhinwari, who lived in the *Lalaris*' or Muhammadan cloth-dyers' quarters. She earned her livelihood, such as it was, by begging, and had lately been in other villages; but it was never discovered from which village she brought the disease. She was quite collapsed when first seen; and though she rallied a little when placed in hospital, she was never able to give an account of her movements, and died two days later.

On the occasion of finding this case, the people of Banga turned out in large numbers and almost blocked the road, and put on a very threatening attitude, shouting out at the top of their voices that the case had been imported from another place by one Pir Bakhsh, in order to obtain the reward. It was only after much persuasion, and after they saw that only the *mohalla* in which the woman lived was going to be evacuated and that Pir Bakhsh was going out into camp together with the other *Lalaris*, that they were pacified. There was no foundation for the report that the woman had been brought when sick from another village.

Banga being a town, and containing many people of various trading occupations, we realized that it must be treated on rather different lines to the ordinary villages, where turning the whole population out into camp caused very little hardship except the actual discomfort of people having to leave their homes. In the case of Banga many people would suffer large pecuniary loss by being placed in camp, and many of the traders would lose their occupation altogether.

The people, moreover, were noted for being exceptionally troublesome, and the saying that the "*Banga log bahut bingha hain*" was commonly quoted. Therefore, with the sanction of the Commissioner (Colonel Massy), we started at first the *mohalla* system of evacuation—that is, we intended to turn out a large section of the town each time a case was discovered in it.

On March 11th, on discovery of the first case, 87 people were placed in camp. The entrance to the *mohalla* was bricked up with an eight-foot wall before any one was allowed to move, and the people thus cut off were removed through an opening in the outer wall of the town. On reference to the accompanying diagram it will be seen that the *mohalla* was situated against the outer wall at the northern part of Banga, and by the means employed was entirely cut off from the rest of the town. The camp was situated about half a mile away, to the north-west, and strongly cordoned. After these people were in camp, 2 of them were attacked, one four days and the other eight days after removal. The *Lalaris* after this remained quite healthy and on April 15th returned to their quarters. On March 28th (seventeen days after the *Lalaris* had been out in camp) 3 more cases were discovered in a

mohalla called the *Thatharian* or brass-worker's *mohalla*. The cases were found in two houses, one a Khatri's named Devi Dial, who had two children down with the disease, and the other the son of a Brahmin named Billu. On referring to the diagram, it will be seen that the houses are practically situated one on either side of the *Lalaris*' *mohalla*. This *mohalla* had been quite emptied and all the entrance had been blocked by the wall marked A. Moreover, the *Lalaris* were out in camp, and were at the time practically healthy, as the two cases in hospital were now convalescent, and besides the Khatri and Brahmins had no connection whatever with

them. The question naturally arises, how were these three children attacked?

Supposed manner of the spread of the disease in this case.

house in the *mohalla*

Certain facts make it likely that rats may have been the cause. A day or two before this, some of the disinfecting gang saw a rat die in the middle of a room in a *Lalari's* house first infected.

The description given made it seem extremely likely that the rat died of plague. The body of the dead animal was placed in a convenient place for our inspection. When we arrived a short time later it had mysteriously disappeared. At the time, a cat, which had been seen shortly before, was supposed to have snatched away the rat and departed. On the morning that Billu's child had been attacked a very offensive smell was noticed in the room, and on investigation a dead and putrefying rat was found. It is not inferred from this that the rat thus found in Billu's house was the same one that had been removed by some unseen agency from the *Lalari's* house. But, as in the latter case the rat found had died of plague, it is reasonable to suppose that the one found in Billu's house was also a plague rat. At any rate, it is the only hypothesis we have for accounting for the disease spreading from the *Lalari's* quarters.

In the case of this second *mohalla*, called the *Thatarian's mohalla*, or *Bashambar Das's mohalla*, from the name of the most influential resident, the four entrances on the town side were blocked up by brick walls (marked C in the map) by Mr. Jones exactly in the same way as the first *mohalla* had been cut off from the rest of the town, and the people were got out into a separate camp in the fields through an opening in the town wall (marked D in the diagram). In this way 203 persons were evacuated, and all the houses surrounding the *Lalari mohalla* and *Devi Dial* and *Billu's* houses were entirely emptied. A police guard was placed over the only remaining entrance (at D) to this area, as had been previously done in the case of entrance B in the former *mohalla*. The people in camp were also cordoned and had no communication with either the former camp or with the people in the rest of the town. They had 13 more cases of plague after they left their homes, the last case occurring ten days after being in camp. There were 2 deaths from other causes before they returned to their homes, two months later.

On April 7th, a third section of the town became infected. A little Brahmin girl living in a house situated in a *mohalla* known as *Kirpa Ram's* was attacked and died. This *mohalla* is in reality only a continuation of the lane which forms the principal street of the previous *mohalla*, and the house in which the case occurred was the next one beyond the temporary wall which had been built to separate the two *mohallas*. It seems as if after an interval of ten days the disease had spread from the last *mohalla*, just in the same way as it had done from the first to the second *mohalla*, after an interval of twenty-one days. But in this case we have no evidence to give as to the agency by which it spread.

This third *mohalla* was closed by a wall marked E in the diagram, and the people taken out into camp by an opening made in the town wall at F: 249 persons were placed in a large camp situated at the north of the town: among these there were only 4 more cases of plague, the last 2 of which occurred on the 16th, i.e., nine days after being in camp.

After this there was another interval before fresh cases occurred, and the *mohalla* next affected was situated some distance from the previous ones. The cases were a man named *Hamera* and *Jawala* his son, both *Sunars*. They were found on April 16th. *Hamera* had been attacked two days previously, and his son the previous day. They lived in *mohalla Rorian*, which contained 64 people. It was immediately evacuated. It appears that *Hamera* kept a shop (marked thus * in the map) in which a plague rat, seen coming from the direction of the second infected *mohalla*, had died. A day or two previous to his being attacked the people standing by advised the owner to leave his shop, but he only laughed and had the rat thrown away. Among these people placed in camp, 3 were attacked on April 22nd, six days after evacuation.

On April 17th and 18th people in three other *mohallas* in various parts of the town were found attacked, viz., a *Sundar* in *Arti mohalla*, a Brahmin in *Sarga mohalla*, and a sweeper in the sweepers' quarters at the south-east of the town (this last is not shown in the map). It now began to be apparent that the *mohalla* system of evacuation, though carried out with the utmost care and with special advantages,—for our first three *mohallas* had been situated on the outskirts of the town,—had failed, and that we must be prepared for an entire evacuation of the place as soon as possible.

In the meanwhile we continued to move out small *mohallas* whenever affected. On this date we moved out 56 people. Only 3 of these were afterwards attacked, the last case occurring four days after evacuation.

On April 19th another Chimba in another Chimba's quarters was attacked, as were also two Kalals, one in the *Lutian mohalla* and the other in *Amar Nath's street* or *Kurian mohalla*: 56 people were evacuated and 4 more cases occurred among the Kalals, the last six days after evacuation.

On April 22nd a *Ramdasi* woman named *Premi*, living in the *Khojean* quarter, became ill with fever, and during the night in a state of delirium threw herself down the *Ramdasis'* well and was drowned. It is pretty certain that she had plague. The number of people evacuated on this date is not stated. But no more were attacked.

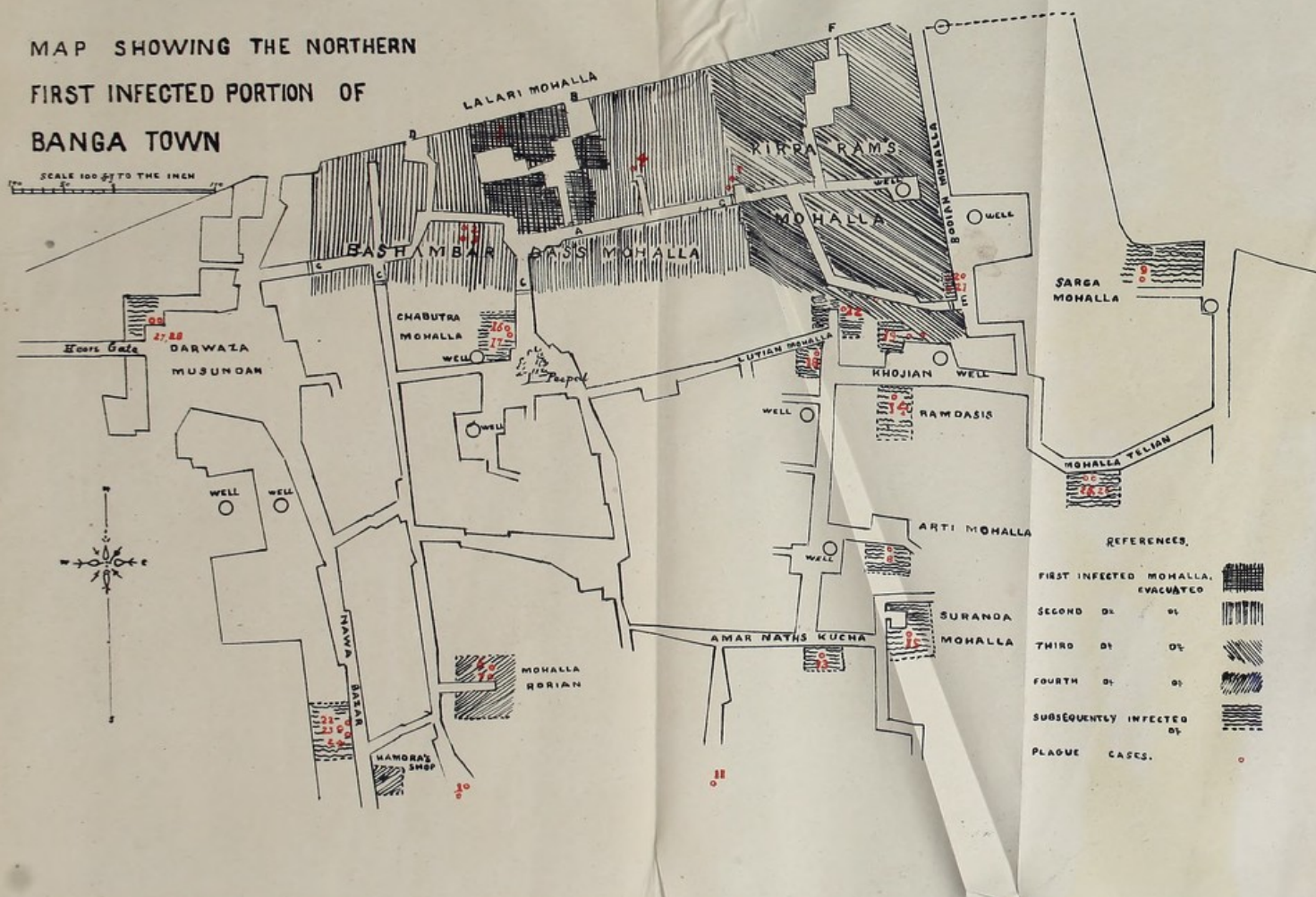
On April 23rd, *Dev Raja*, *Khatari*, a boy, was attacked in the *Seranda mohalla*: 28 people were evacuated and no new cases followed.

On the 25th, two Brahmins were attacked in the *Chabachra* quarter, which adjoined *Kirpa Ram's mohalla*. The house infected was separated from the wall barrier, placed to prevent entrance to the old *mohalla*, by another house in which dead rats had occurred. One of these was shown us and was found to have died of plague. Nobody in this house was attacked. This may possibly be due to the fact that they had all been inoculated with *Haffkine's* serum. No dead rats were found in the infected house. A third Chimba, from a third Chimba quarter, was also admitted on this day: 28 people in all were moved out into camp, of which only 1, *Dia Banti*, the Chimba's infant child, was attacked on the 28th.

On the 26th, a case was found in the *Khojean mohalla*, opposite to where the *Ramdasis* lived, and 14 people more were placed in camp.

On the 27th, things came to a climax, and no less than 16 new cases were reported, of which 15 had occurred in the town. It was now absolutely absurd to continue the partial evacuations. Consequently all the remaining people were given notice to go out into camps, and suitable sites for the various sections and castes were selected near groves of trees. The people began going out early on the morning of the 28th, and the town was completely empty by the evening of the 30th. There were 8 cases reported on the 29th, 3 on the 30th, 6 on the 1st, 2 on the 3rd, 8 on the 4th, 2 on the 6th, 1 on the 13th, 1 on 16th and 17th, when the disease seemed to stop. A case was afterwards discovered in an outlying camp on June 20th, but the man had been ill almost from the day he left the village. A new Hospital Assistant was in charge of this camp and mistook the buboes in the neck for scrofula. The patient made a rapid recovery after getting into hospital, and fortunately no other members of his family were attacked. The accompanying table, Table No. 4, shows the effect of the evacuation in the various camps.

SCALE 100 ~~5~~ TO THE INCH





From the above description it will be seen that the partial evacuation of the town carried out during March and April totally failed to stop the onward march of the disease. Though large sections of the town were emptied, and brick walls were built across the streets leading to the affected quarters, the disease seemed to slip past us and attack fresh portions of the town. In spite of this, it showed a wonderful tendency to die out in the camps situated in the open and composed of the families and neighbours of the affected persons.

There is strong reason for believing that rats were the cause of this spread. We have already shown that dead rats were found in the dwellings of two of the cases (Billu and Hamera). We ourselves saw a plague-stricken rat dragging its feeble and feverish frame along an open street in broad daylight. The street was situated at the south of the town behind the school, a part which up to that time had not been attacked. And yet the microscopical examination of and the culture made from the spleen gave us typical plague bacilli.

On 21st April plague rats were found and examined from the local dispensary, an isolated building about 200 yards to the south-east of the town. The occupants, including the patients, were immediately turned out into a grove, and all escaped the disease.

After all the people had left Banga, dead rats were found lying about in the shops situated on the Phagwara-Nawashahr main road. And there can be little doubt that the people whose houses occupied the south portion of the town were saved by having been placed in camp before the diseased rats had reached their houses.

The disinfection of the houses was started in March, but not completed till June 27th. The work was most difficult, as there were not only 1,600 houses to be done, but many of them contained numerous rooms stored with merchandise, which required careful taking out, disinfecting and returning. Many of the old bricked houses were in a dilapidated condition, and in some we were unable to make the usual ventilation holes, but had to trust to a plentiful application of disinfectants and lime-wash.

The people were told that they might return to their dwellings on June 28th. But this appears to have been an unpropitious day, and not a soul made a move till the 29th, when 4,900 people returned to their homes. During the previous ten days every camp had been disinfected, and every man, woman and child had undergone the ordeal of the "phenyle bath." When the time came nothing remained but to give the word, and the people loaded up their carts, and in a few hours every camp was deserted. Heavy rain fell on the evening of the 29th. But most of the people had already closed the *mogas*, or large holes made by us in their roofs to let in the purifying agents—sun and air.

Prophylactic inoculations were done in this town on a large scale, and will be referred to in another section. (See page 132).

There were 103 attacks in all, with 65 deaths, making a percentage of 2·7 attacked, with a mortality of 63·1 per cent.

26. KATT.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 759 |
| Roll-call | ... | ... | ... | ... | ... | ... | 679 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 38 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 527 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 114 |
| Number of houses | ... | ... | ... | ... | ... | ... | 148 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 17 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 29 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 20 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 9 |
| Date of first case | ... | ... | ... | ... | ... | 24th February 1898. | |
| Do. returned | ... | ... | ... | ... | ... | 12th March 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 12th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 12th do. | |
| Do. evacuation of village | ... | ... | ... | ... | ... | 16th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 26th do. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 16th May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 25th April 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 23rd May 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 2nd June 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 2nd do. | |

Information concerning Katt reached us on March 12th, and the village was entirely evacuated on the 16th.

The disease seems to have started in a Khatri's house, which is situated in front of the main entrance to the village. This Khatri, whose name was Nathu, was in the habit of going with his grown up sons to Sirhal Qazian to see his friend, another Khatri. They brought the disease back with them on or about February 24th, and at first only members of this household were attacked. They kept the existence of the disease very secret, and had not Uttam Dai, Nathu's young wife, applied to outsiders for leeches, which were applied to the bubo in the left groin, this family might have gone on some time longer without the disease being discovered.

However, on turning out the village other cases came to light. The disease spread to the Jats, 21 of whom were attacked. It is also interesting to note that 5 Tarkhans were also attacked. It will be remembered that this class suffered severely in Khankhanan: it was probably a Tarkhan who brought the disease from Khankhanan to Sirhal Qazian. In this village again we have a large number of this caste attacked.

There were 29 cases in this village, with 20 deaths. The last case occurred on 25th April, one month and nine days after evacuation. This is one of the latest attacks we have had after evacuation.

(27). HAPHOWAL.

| | | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | ... | 517 |
| Roll-call | ... | ... | ... | ... | ... | ... | ... | 585 |
| Muhammadans | ... | ... | ... | ... | ... | ... | ... | 13 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | ... | 472 |
| Chamars | ... | ... | ... | ... | ... | ... | ... | 100 |
| Number of houses | ... | ... | ... | ... | ... | ... | ... | 106 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | ... | 4 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | ... | 13 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | ... | 3 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | ... | 10 |
| Date of first case | ... | ... | ... | ... | ... | ... | 12th March 1898. | |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 12th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 12th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 12th do. | |
| Do. evacuation do. | ... | ... | ... | ... | ... | ... | 29th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 21st April 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 20th May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | ... | 4th do. | |
| Do. return to village | ... | ... | ... | ... | ... | ... | 28th do. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 7th June 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 7th do. | |

The manner of introduction of the disease into this little village is not quite clear. On March 12th the hospital assistant (Ganpat Rai) on inspection duty shewed us a little child named Jowala, the son of a Jat named Nihal Singh. This child had only been taken ill that morning. But it had a well-marked small acutely tender gland and other symptoms of plague. The only history we could get was that the child's brother, Meemull, had gone a few days previously to Jhandher Khurd to get sugarcane seeds, which he had brought to Haphowal and sown. It is possible to conceive that though Jhandher Khurd was now free from plague and had been so since December, except the imported case on February 19th, the infection may have remained in the seeds, which were gathered when the epidemic was at its height. But I believe this to be extremely unlikely: the child's sister, Dhanni, was married to a boy named Hazara, son of Goll, who still lived at Jhandher Khurd. It is more likely that Meemull brought clothes or infected articles from some of the villages, such as Dahan, by which he would have to pass to get to Jhandher. But we have no proof of this. The whole of the Jat family at Haphowal were placed the same night into camp and their house locked up. It was disinfected a few days later. All went well for a fortnight; no new cases occurred, and none of the Jats in the camp were attacked. The little child recovered. On March 28th the lambardars of the village reported that a Tarkhan family at the opposite side of the village had been attacked. No less than 3 Tarkhans and a Jattiwee

Extension of the disease in the village.

attacked. It is interesting to note that the whole village had been turned out and a roll-call of the village failed to detect the disease. roll-call held by the inspecting officers on the same morning and no unusual illness found. This has happened several times in our experience. Villages have been carefully inspected by the inspecting staff and nothing discovered, and a few hours later plague has been found to be present. We do not think any blame is due to the inspecting officers. It only shows how easy it is for the villagers to hide cases in their villages if they wish to do so. This question will be discussed under the section dealing with inspections.

Evacuation, &c.

The whole village was evacuated on March 29th.

The last case occurred on the 4th May, when a Chamar on disinfection work was attacked. But the epidemic really stopped on April 16th, when the last Tarkhan was attacked. Only 13 people in this village were infected, and out of these only 3 died. So that Haphowal gave the best results of any of our villages.

The patients were treated in huts, and no special hospital was built for them.

The people returned to the village on May 28th, having been two months and a day in camp.

On the day of allowing them to return, and when making a preparatory inspection and disinfection of the camp, we found a small boy with enlarged glands in both groins. He seemed apparently quite well and had no fever, nor had he been ill. He and his family were kept out in camp. The boy was well again in a few days and the glands entirely disappeared. We believe these to be cases of plague in an extremely mild form—the pestis minor or pestis ambulans of some authors.

Pestis minor.

(28). CHAK BILGA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 829 |
| Roll-call | ... | ... | ... | ... | ... | ... | 831 |
| Muhammadians | ... | ... | ... | ... | ... | ... | 131 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 511 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 181 |
| Sweepers | ... | ... | ... | ... | ... | ... | 8 |
| Number of houses | ... | ... | ... | ... | ... | ... | 174 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 28 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 33 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 22 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 11 |
| Date of first case | ... | ... | ... | ... | ... | 10th March 1898. | |
| Do. do. returned | ... | ... | ... | ... | ... | 13th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 13th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 13th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 15th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 23rd April 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 29th May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 14th April 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 31st May 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 9th June 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 9th do. | |

Chak Bilga is a small village of 831 people, situated to the east of and less than quarter of a mile from Katt. All accounts agree in stating that Mela Ram, son of Jowhir, a Brahmin, aged 18 years, was the first person attacked. This youth was seen by us on March 14th, when he had been ill only four days.

The lambardars on being informed that it was a case of plague, of their own accord and without any hint from the plague officers, asked to be allowed to come out into camp immediately, as they stated that rats had been noticed to be dying for some days in the village and they had heard that when this was the case many people died of plague. Suitable camping grounds were immediately selected, and in less than an hour after the disease had been discovered people started getting out into camp. But the village was not completely evacuated till two days later.

Infection probably by rats from Katt.

In spite of this promptness, 33 people were attacked and 22 died.

The cause of this village being infected is that either Jowhir brought it from Katt, or the rats did so instead, or thirdly both Jowhir and the rats were infected by some common cause of infection such as infected property brought from the other village. In the absence of any other information we are inclined to believe that the rats were the agents which transmitted the malady. They were certainly the first, as far as our information goes, to be attacked.

(29).—DAHAN.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 574 |
| Roll call | ... | ... | ... | ... | ... | ... | 535 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 29 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 395 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 103 |
| Sweepers | ... | ... | ... | ... | ... | ... | 8 |
| Number of houses | ... | ... | ... | ... | ... | ... | 122 |
| Do. infected | ... | ... | ... | ... | ... | ... | 31 |
| Number of plague cases returned | ... | ... | ... | ... | ... | ... | 47 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 35 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 12 |
| Date of first case | ... | ... | ... | ... | ... | 7th March 1898. | |
| Do. do. | ... | ... | ... | ... | ... | 13th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 13th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 13th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 15th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 3rd April 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 3rd May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 2nd April 1898. | |
| Do. returned to village | ... | ... | ... | ... | ... | 7th May 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. | |

Dahan is a small Jat village situated to the north of Mallupota from which there is little doubt that it received its infection. Infection brought in property from Mallupota. An attempt was made to hide the fact that plague Rats early affected. was present, and when on March 13th the disease was discovered, no less than 5 cases and 2 corpses were brought to light in the village, and more cases occurred before anything could be done. The first case appears to have been a *lohar* woman named Ram Kaur, whose dead body was seen by us on our arrival. Ram Kaur's mother, Khemi, wife of Bhana, was subsequently attacked and died. It appears that another *lohar*, named Kahna, had previously brought clothes and property from Mallupota just before that village had been cordoned, and deposited them in Ram Kaur's house. If these were the causes of the epidemic it will be noticed that there was an interval of 23 days between the time the clothes were brought on February 12th and March 7th, when Ram Kaur was attacked. A number of dead rats were subsequently found in this house and in the neighbouring ones when they came to be disinfected. The early infection of rats had the usual result that a large number of persons fell victims to the disease: 47 persons became ill, of whom 35 died, making a percentage to population of 12·3 attacked and a mortality of 74·4 per cent. among those attacked. It should be mentioned that 12 persons were attacked in the village and 28 during the first eight days after evacuation, who probably got infected in the village, and the remaining 7 were afterwards affected. The last case was attacked on April 2nd, eighteen days after evacuation.

The people returned to the village on May 7th, having been one month and twenty-one days in camp.

There is little doubt that in this instance we came to the village at the moment the disease had burst forth in a virulent and wide-spread manner, and by promptly turning every one out into camp, which we did the following day, we quickly put an end to the epidemic.

(38).—BAHRWAL.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 778 |
| Roll call | ... | ... | ... | ... | ... | 677 |
| Muhammadans | ... | ... | ... | ... | ... | 54 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | 460 |
| Chamars and Ramdasias | ... | ... | ... | ... | ... | 154 |
| Sweepers | ... | ... | ... | ... | ... | 9 |
| Number of houses | ... | ... | ... | ... | ... | 130 |
| Do. do. infected | ... | ... | ... | ... | ... | 9 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 22 |
| Do. deaths returned | ... | ... | ... | ... | ... | 14 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 8 |
| Date of first case | ... | ... | ... | ... | ... | 23rd March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 1st April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 1st do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 1st do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 2nd do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 23rd do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 26th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 2nd June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 12th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 12th do. |

Bahrwal seems to have had two sources of infection, both of which declared themselves at the same time, in two different parts of the village. It appears that Hari Ram, the patwari of Mallupota, finding that there was plague in the village, instead of reporting the matter to the authorities, spent all his time and energy in getting his property out of the village. He got two men, Daler Singh and Uttam Singh, to help him. These men came over to Mallupota with a cart from Bahrwal and took over the property, which they stored in their house. They were afterwards both attacked with plague, and both died.

The other infection was from Dahan. Janu, son of Bura, a *teli*, whose business consisted of carding cotton, ran away with his wife and family on the discovery of plague at Dahan on the 13th March. Umri, his daughter, became ill on or about March 23rd, Mahun, his son, on the 24th, and Jewni, his wife, became ill a little later, and aborted and died on March 31st.

The disease was discovered by the authorities on April 1st, and the village totally evacuated by the evening of the following day. There were altogether 22 attacks, with 14 deaths. The last case occurred on the 26th April, twenty-four days after evacuation.

The cause of the last two cases was traced to the fact that the people attacked had surreptitiously been in the village the day before they were attacked to get out various household articles which they required.

The people were allowed to return to their homes on the 2nd June, after having been exactly two months in camp. The disinfection of the people in camp and their property took two days and was carried out by Dr. Darabseth.

(39).—MAZARI.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 467 |
| Roll call | ... | ... | ... | ... | ... | 432 |
| Muhammadans | ... | ... | ... | ... | ... | 7 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | 277 |
| Chamars | ... | ... | ... | ... | ... | 133 |
| Sweepers | ... | ... | ... | ... | ... | 15 |
| Number of houses | ... | ... | ... | ... | ... | 92 |
| Do. do. infected | ... | ... | ... | ... | ... | 3 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 8 |
| Do. deaths returned | ... | ... | ... | ... | ... | 4 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 4 |
| Date of first case | ... | ... | ... | ... | ... | 1st April 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 2nd do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 2nd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 2nd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 3rd do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 23rd do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 24th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 10th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 28th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 7th do. |

The next village after Barhwal was Mazari, a little Jat village containing 432 inhabitants and situated directly south of the last considered village. Here the only history of infection which we could obtain pointed to the disease having been brought from Khankhanan. Bhana, son of Chajju, a Jhinwar, who was certainly the first person attacked at Mazari, had a paternal aunt named Ralli, wife of Mela, son of Khushal Singh, at Khankhanan whom he often visited, breaking the cordon round the latter place in order to do so. But Khankhanan had been free from disease since the 28th of January, two months previously, and besides no Jhinwar in Khankhanan were ever attacked with plague. We think it much more likely that the disease was brought from Mallupota, the next village,—in fact we have several instances of the cordon having been broken and persons passing through at night from one village to another. For instance, a patwari named Moti Ram is known to have several times come to this village from Mallupota, breaking through the cordon. On one occasion at least he brought clothes and came with his relatives Ganda and Nand Lal. Both Ganda and his wife subsequently died of plague. Several Jhinwars were attacked at Mallupota. Jhinwars are particularly likely to be the first infected, as they not only act as water-carriers, but are used as domestic servants in many cases and as *kahars*, when women and goods, &c., have to be conveyed from one place to another. With these remarks we must pass on to other subjects and be content to leave the question as to the mode of infection in this village as unsettled for the present.

The village suffered very slightly. There were only 8 patients, of whom 4 died. All the cases, except the one which died in the village, were treated at the Banga plague hospital.

(40).—SALH KHURD.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 180 |
| Roll call | ... | ... | ... | ... | ... | 152 |
| Muhammadans, chiefly Gujar | ... | ... | ... | ... | ... | 88 |
| Hindus | ... | ... | ... | ... | ... | 10 |
| Chamars | ... | ... | ... | ... | ... | 37 |
| Sahnsis | ... | ... | ... | ... | ... | 17 |
| Number of houses | ... | ... | ... | ... | ... | 42 |
| Do. do. infected | ... | ... | ... | ... | ... | 8 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 16 |
| Do. deaths returned | ... | ... | ... | ... | ... | 8 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 8 |
| Date of first case | ... | ... | ... | ... | ... | 29th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 3rd April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 3rd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 3rd do. |
| Do. evacuation of do | ... | ... | ... | ... | ... | 6th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 4th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 5th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 10th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. |

Salh Khurd is quite a small village composed of about 42 houses, and containing 154 persons. It is situated west of Salh Kalan, and is intimately connected with that village. In fact, the chamars, who live in a separate group of buildings placed between the two villages, work for inhabitants in both villages. Like the people in Salh Kalan, the people in Salh Khurd have relatives in Purkhowal. They are also mostly composed of Gujar. It is, therefore, not surprising that this village, like its larger sister, soon became infected.

The disease was discovered on April 3rd, when an old Gujar woman named Nanki and a Gujar girl, named Lado, were found, as well as 3 chamars in the chamars' isolated set of buildings. The first person attacked was a chamar shoemaker, named Meyer, son of Kurah, who became ill on the 29th March. He probably got his infection from the chamars who

worked for Salh Kalan, and whose house was close to his. He in turn infected other chamars, who infected the Gujar families for whom they worked.

The village was turned out, but eleven cases occurred in the village before the evacuation was completed. After this there were only 5 cases. In fact, the epidemic stopped on the fourth day after the people went into camp.

The disinfection of the village was carried out in connection with Salh Kalan. The people returned to their houses on 7th May, having been only one month in camp.

(41).—HEON.

| | | | | | | |
|---|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,283 |
| Roll call | ... | ... | ... | ... | ... | 1,294 |
| Muhammadans, chiefly Arains and Rajputs | ... | ... | ... | ... | ... | 860 |
| Hindus | ... | ... | ... | ... | ... | 107 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | 295 |
| Sweepers | ... | ... | ... | ... | ... | 28 |
| Sahnies | ... | ... | ... | ... | ... | 4 |
| Number of houses | ... | ... | ... | ... | ... | 255 |
| Do. do. infected | ... | ... | ... | ... | ... | 1 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 2 |
| Do. deaths returned | ... | ... | ... | ... | ... | 1 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 1 |
| Date of 1st case | ... | ... | ... | ... | ... | 30th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 3rd April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 3rd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 3rd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 4th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 10th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 28th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 3rd April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 24th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 4th do. |

This is a large Muhammadan Rajput village situated on a hill about a mile and a half north of Banga. The zaildār reported two cases on April 3rd. These were a Sahnsi named Likur and his infant son, Isher, who was only six months old. It appears that the child was first attacked on March 30th and the father two days later. The Sahnies are a wandering tribe of criminals, who earn their livelihood by stealing. This man with his wife and child were in the habit of wandering about looking for "whatever the gods were pleased to put in their way." The zaildār reported that the Sahnsi had been thieving cattle's food from both Balon and Salh Kalan, both infected villages, a few days before his attack. He took his wife and child with him on these foraging expeditions. It is also known that he spent much of his time nursing his little son, of whom he was very fond. It is an interesting question whether he and the child contracted the disease at the same time. It is possible that this is the case, and the child shewed symptoms first because it had a much smaller body, and therefore less material on which the plague bacilli could work before toxic symptoms would make their appearance. On the other hand, it is possible that the child first contracted the disease and communicated it to its father. If this were the case, it is strange that the mother who nursed the child at the breast never contracted the illness.

The Sahnsi's family, which inhabited a detached hovel, at the south of the village, were put out into camp, and no more cases occurred. The dwelling, which had a thatched roof, was assessed by the civil authorities and set light to and burnt.

The whole village of Heon was evacuated on the following day, and remained in camp till the 24th of the month (20 days). The houses were not disinfected, but fresh lime was given to the lambardars, and under their supervision the people cleaned up their own houses, whitewashed the walls and made suitable openings in their roofs.

(42).—LANGERI.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,331 |
| Roll call | ... | ... | ... | ... | ... | 1,254 |
| Muhammadans, chiefly Arains | ... | ... | ... | ... | ... | 872 |
| Hindus | ... | ... | ... | ... | ... | 169 |
| Chamars | ... | ... | ... | ... | ... | 183 |
| Sweepers | ... | ... | ... | ... | ... | 12 |
| Sahnsis | ... | ... | ... | ... | ... | 18 |
| Number of houses | ... | ... | ... | ... | ... | 266 |
| Do. " infected | ... | ... | ... | ... | ... | 8 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 24 |
| Do. deaths returned | ... | ... | ... | ... | ... | 18 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 61 |
| Date of first case | ... | ... | ... | ... | ... | 1st April 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 4th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 4th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 4th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 5th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 20th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. |

This is also a Muhammadan village situated on an eminence and adjoins the infected villages of Mallupota and Lakhpur. It was discovered to be infected on April 1st, the lambardars of the village themselves giving the information about the illness. On the arrival of the plague officers 3 Gujars and an Arain (2 women and 2 children) were found to be suffering. The manner of the infection of the village is obscure. A chamar named Nathu was known to have visited his son, Ghudu, and other members of his family at Lakhpur, but neither he nor any of the chamars ever got the disease. In the same way other persons had gone into Mallupota to see relatives, but we were unable to trace any connection between these persons and Basso, wife of Lakka, Arain, and Jeji, wife of Nibala, Gujar, who seem to have been the first persons attacked at Langeri.

The village was evacuated on April 5th into three large camps and a small segregation camp. The patients were treated at Mallupota plague hospital. But when that hospital was dismantled on 1st June, they went to Dhandhua hospital, which was really closer to their own homes. The disinfection of the village took a long time owing to the want of labourers, but was completed on June 7th: 24 persons in all fell victims to the malady, of whom 5 were attacked in the village. The epidemic stopped on the 16th—eleven days after the evacuation. But 2 sporadic cases occurred on the 2nd and 3rd May in the health camp. The cause of these is unknown.

| | |
|------------|-----------------------|
| 15 Arains, | 2 Muhammadan Rajputs, |
| 5 Gujars, | 1 other caste, |
| | 1 Sheikh. |

There were 18 deaths, making a mortality of 74·5 per cent.

The village returned on 7th June, having been two months and two days in camp.

(43).—LALPUR.

| | | | | | | |
|------------------------------|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | 219 |
| Roll call | ... | ... | ... | ... | ... | 249 |
| Muhammadans, chiefly Mughals | ... | ... | ... | ... | ... | 223 |
| Chamars | ... | ... | ... | ... | ... | 24 |
| Sweepers | ... | ... | ... | ... | ... | 2 |
| Number of houses | ... | ... | ... | ... | ... | 60 |
| Do. do. infected | ... | ... | ... | ... | ... | 10 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 29 |
| Do. deaths returned | ... | ... | ... | ... | ... | 21 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 8 |

This village was reported to be infected the same day as Lalpur, viz., April 5th, but as there was some doubt about the case seen being plague, it was left till next day for fuller investigation. The following morning a fresh case had developed, and plague was officially announced, and the village immediately evacuated. The first case attacked was Jawali, a Jat widow, aged 30 years.

Mode of infection. She had been ill four days when first seen, but the attack was a very mild one. It appears that a few days before she was attacked she went to her father's house at Bahrwal to see her brother, Attar Singh. It is therefore probable that she contracted the illness in this village. Another case was found when the village was being turned out. Twenty-eight cases in all occurred, of which 15 died. As happened in Lalpur, all the first cases were women.

There is nothing special to mention about this village, except that the last case attacked was a chamar who had been on disinfection work attacked. infection work. He was the only man of this caste attacked in this village.

(52).—DHANDHUA.

| | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 486 |
| Roll call | ... | ... | ... | ... | ... | ... | 492 |
| Muhammadans, chiefly Arains and Gujars | ... | ... | ... | ... | ... | ... | 432 |
| Hindus | ... | ... | ... | ... | ... | ... | 14 |
| Chamars | ... | ... | ... | ... | ... | ... | 46 |
| Number of houses | ... | ... | ... | ... | ... | ... | 115 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 17 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 23 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 13 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 10 |
| Date of first case | ... | ... | ... | ... | ... | ... | 10th April 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 15th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. last case | ... | ... | ... | ... | ... | ... | 7th do. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 9th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 20th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 20th do. |

A Muhammadan village situated between Lalpur and Dahan on the east, Chak Bilga on the west, and Langeri on the south—all plague-infected villages—was therefore not likely to remain free very long. A case of plague was discovered in it on April 14th—a girl, named Rahman, daughter of Ibrahim, who was attacked three or four days previously. It is not very clear how the disease entered the village: one story is that two Tarkhans, named Ram

Mode of infection. Ditta and Sahib Ditta, worked in Natha Khan's house at Langeri, and that both their wives contracted the disease at Dhandhua and died of it; another story is that these two men used to get food from their friends in Chak Bilga. A sepoy on the Chak Bilga cordon used to help them in this transaction. It was difficult for obvious reasons to get at the root of the matter. But neither Sahib Ditta nor Ram Ditta's family were affected before Rahman. We are therefore inclined to believe that the infection of the village took place before this time, and possibly other infections occurred later. A village situated as Dhandhua was, within a mile of which were four other infected villages, would get infected with the utmost ease. Nothing has transpired to make us believe that the infection took place by rats or, indeed, anything but by human agency.

There were 23 cases, with 13 deaths, the last case occurring on May 6th, twenty-one days after evacuation. On April 30th 4 people were attacked who had gone into the village against orders, showing conclusively that infection still lingered in the houses, though it had practically died out in the camps. The cases which occurred after this date were relatives of these persons who lived in the segregation camp.

Four people who went into the still infected village were attacked fifteen days after evacuation.

(54).—GOBINDPUR.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 1,158 |
| Roll call | ... | ... | ... | ... | ... | ... | 1,140 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 14 |
| Hindus, chiefly Sainis | ... | ... | ... | ... | ... | ... | 896 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 230 |
| Number of houses | ... | ... | ... | ... | ... | ... | 269 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 11 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 24 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 11 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 13 |
| Date of first case | ... | ... | ... | ... | ... | ... | 8th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 15th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 15th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 15th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 25th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 25th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 4th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 13th May 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 18th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 18th do. |

The disease seems to have been brought to this village from Salh Kalan. It will be remembered that a youth, named Puran, a Jhinwar, went to see Munshi when he was ill. He came back and had some fever and an enlarged gland in the left groin. But, as he never laid up, he was altogether overlooked for a time. He appears to have infected Gondah, a Sunar, who lived in a house close to his, and who died on April 14th. Gondah's wife became ill on the same day.

When the plague officers visited the village on April 15th, they saw Gondah's corpse, and his wife, who was there very ill. As the disease seemed localized to one house (Puran was then not discovered), a partial evacuation of the village was determined on, and the inhabitants, 32 in number, of seven houses were placed in a segregation camp. The next few cases occurred among these people. But on April 25th cases began to occur in the village, and consequently the whole village had to be evacuated. This was carried out on the same day. The healthy people were placed in three large camps, called Sunder Singh's camp, Chamars' camp and Ram Ditta's camp.

During the disinfection of the village, four persons were attacked on the same day: one of these persons included the hospital assistant, Lal Chand. The house they had all been working in was not previously known to be infected, but dead rats were found in it at this time.

Out of the 24 persons attacked, 14 were women. Rather, a large number of different castes were also represented, viz.—

| | | | | | | |
|-----------------|-----|-----|-----|-----|-----|----|
| Sainis | ... | ... | ... | ... | ... | 5 |
| Chamars | ... | ... | ... | ... | ... | 6 |
| Sunars | ... | ... | ... | ... | ... | 2 |
| Jhinwars | ... | ... | ... | ... | ... | 2 |
| Mohammedan Jats | ... | ... | ... | ... | ... | 8 |
| Brahmin | ... | ... | ... | ... | ... | 1 |
| Total | ... | ... | ... | ... | ... | 24 |

The last case occurred nineteen days after the total evacuation of the village.

(65).—MALLAH.

| | | | | | | | |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 443 |
| Roll call | ... | ... | ... | ... | ... | ... | 428 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 16 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 336 |
| Chamars | ... | ... | ... | ... | ... | ... | 76 |
| Number of houses | ... | ... | ... | ... | ... | ... | 98 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 6 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 11 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 9 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 2 |

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Date of first case | ... | ... | ... | ... | ... | ... | 21st April 1898. |
| Do. do. | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 8th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 30th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 14th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 24th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 24th do. |

This small village was attacked about April 21st, and the disease discovered on the 26th. The disease is supposed to have been brought from Dahan. A man named Sunder Singh brought some property belonging to Hira Singh from Dahan. He got plague himself and died. Kirpa Singh, his son, after his father's death, realized that the property from Dahan had been directly or indirectly the cause of his father's illness and sent the goods back to Dahan. This, however, he did not accomplish till June 22nd, when both villages had been declared free.

It is difficult to determine the date when this property came over to Mallah. But Hira Singh himself was attacked on 20th March and died in the Mallupota hospital on the 26th. It is probable that the clothes and other articles were conveyed away after his death, as the villagers were then under the impression that the clothes of all persons dying of plague were burnt. We have no record of when Sunder Singh was attacked, or when he died, as this happened before we came to the village, and on our arrival the villagers, rightly judging that they were about to be turned out of their houses, did not see fit to vouchsafe more information than they were obliged to give. The village was evacuated the same day (26th April).

Four cases which had occurred in the village were found. After the people got into camp there were 7 more cases, 3 on the second day after evacuation, 1 on the third and 3 more on the fourth day in camp. The disease then stopped. None of the patients would submit to European treatment, and were placed with their families in a separate camp. No less than 9 out of the 11 patients died.

The village was re-occupied on 14th June, having been fifty-one days in camp.

(69).—PHARALA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|-----------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 3,214 |
| Roll call | ... | ... | ... | ... | ... | ... | 2,982 |
| Muhammadians | ... | ... | ... | ... | ... | ... | 479 |
| Hindus, all classes, chiefly Jats | ... | ... | ... | ... | ... | ... | 1,964 |
| Chamars | ... | ... | ... | ... | ... | ... | 405 |
| Sweepers | ... | ... | ... | ... | ... | ... | 134 |
| Number of houses | ... | ... | ... | ... | ... | ... | 931 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 10 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 18 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 7 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 11 |
| Date of first case unknown. | ... | ... | ... | ... | ... | ... | |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 19th May 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 19th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 19th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 20th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 31st do. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 27th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 19th do. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 2nd July 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 26th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 31st do. |

This large village, containing nearly 3,000 people and situated much nearer Phagwara than the previously infected villages, was found to contain cases of plague on May 19th.

The mode of infection is obscure. The only information which we were able to obtain was that the first case attacked a woman named Basant Kaur, who had lately gone to a wedding at a village called Kaleran. This village had not been infected as far as we know. But

it was hinted by the people at Pharala that some of the people of Mullah and Bisla had slipped through their respective cordons and attended this wedding. From the nature of the information, it was difficult to get any definite facts as the people seemed afraid that they themselves would get into difficulties.

The whole village was immediately evacuated, and the people placed in four large camps. Heavy rain fell while they were still out; but the sites chosen being high, and the huts sufficiently water-tight, the people suffered very little discomfort.

There were only 18 attacks with seven deaths. A mild case occurred after the people returned to their houses. But the evacuation of a few people was sufficient to prevent any further spread.

The 98 coolies who worked on plague had all previously been inoculated with Haffkine's prophylactic. One of them had undoubtedly plague, which he contracted while on duty. Another man had fever, but it is very doubtful whether the case was actually plague.

(70).—LADHANA JHIKA.

| | |
|--|-----------------|
| Census population (1891) | 1,259 |
| Roll call | 1,327 |
| Muhammadans | 70 |
| Hindus, chiefly Sainis | 1,093 |
| Chamars | 145 |
| Sweepers | 19 |
| Number of houses | 300 |
| Do. do. infected | 4 |
| Do. plague cases returned | 9 |
| Do. deaths | 5 |
| Do. recoveries | 4 |
| Date of first case | 11th May 1898. |
| Do. do. returned | 21st do. |
| Do. declaration of plague | 21st do. |
| Do. cordoning of village | 21st do. |
| Do. evacuation of do. | 22nd do. |
| Do. commencement of disinfection | 1st June 1898. |
| Do. completion of do. | 16th do. |
| Do. last cases | 24th May 1898. |
| Do. return to village | 17th June 1898. |
| Do. removal of cordon | 22nd do. |
| Do. village declared free of plague | 27th do. |

Ladhana Jhika was discovered on May 21st, though there is little doubt that the disease had existed in the place for at least ten days previously.

It appears to have been imported from Mehlghahla, a large village about a mile-and-a-half away. One of the chaukidars, named Channan, of this large village had his home in Ladhana Jhika. He lived in the same quarters as Meru and Sani, two Muhammadan Pathans. These men often come to see Channan at Mehlghahla. The meeting is supposed to have always taken place at the boundary. But whether this rule was strictly carried out is uncertain. But it is known that men from Ladhana Jhika sometimes brought their wives with them, and there is a suspicion that these took away property with them. However, Sani's wife, Salamat, was the first attacked. She lingered on for some time and died on May 23rd. The next to be attacked were the Muhammadan Rajputs living in the same court-yard. Three persons were attacked.

The disease spread quickly to a Jat family which lived in a house only separated from the Muhammadans by a cattle shed. Narain Singh, the head of this family, had three of his women affected. It is curious that all the first cases in this village, as in so many of our villages, were women.

The people came out into camp on May 22nd, after which there were only 4 new cases, making a total of 9 cases in all, 4 of which were fatal. The weather was now extremely hot and the disease showed very little tendency to spread.

The people returned to their homes after having been twenty-six days in camp. After their return a suspicious death took place which might have been due to plague. The family in which the death occurred were segregated in camp for twenty-one days. But as no further illness took place, they were allowed to return to their house.

(71).—BHAURA.

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----------------|
| Census population (1891) | ... | ... | ... | ... | 1,004 |
| Roll call | ... | ... | ... | ... | 1,030 |
| Muhammadans, chiefly Rajputs | ... | ... | ... | ... | 485 |
| Hindus, chiefly Sainis | ... | ... | ... | ... | 328 |
| Chamars | ... | ... | ... | ... | 150 |
| Sweepers | ... | ... | ... | ... | 37 |
| Sahsis | ... | ... | ... | ... | 30 |
| Number of houses | ... | ... | ... | ... | 232 |
| Do. do. infected | ... | ... | ... | ... | 3 |
| Do. plague cases returned | ... | ... | ... | ... | 4, actual 6 |
| Do. deaths do. | ... | ... | ... | ... | 2, do. 3 |
| Do. recoveries do. | ... | ... | ... | ... | 2, do. 3 |
| Date of first case | ... | ... | ... | ... | 1st May 1898 |
| Do. do. returned | ... | ... | ... | ... | 25th do. |
| Do. declaration of plague | ... | ... | ... | ... | 25th do. |
| Do. cordoning of village | ... | ... | ... | ... | 25th do. |
| Do. evacuation of do. | ... | ... | ... | ... | 26th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | 30th do. |
| Do. completion of do. | ... | ... | ... | ... | 16th June 1898. |
| Do. last case | ... | ... | ... | ... | 27th May 1898. |
| Do. return to village | ... | ... | ... | ... | 19th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | 25th do. |
| Do. village declared free of plague | ... | ... | ... | ... | 29th do. |

Bhaura is a small Muhammadan Rajput village situated to the east of Mehlghahla, and near the border of the Hoshiarpur district. It has a bad reputation of harbouring thieves and the receivers of stolen property. After Mehlghahla went out into camp, it was found that though the village area was cordoned with police, not enough men were obtainable to place a guard round the village site. In consequence of this, complaints several times reached us that robberies had taken place in some of the vacated houses. The blame was always placed on people from Bhaura.

We were, therefore, not surprised to find on May 25th that there were 3 cases of plague in this village. The first case attacked seems to have been a Rajput named Jawa, son of Bauna, who came over to Mehlghahla in April and was attacked at the end of that month. He died on May 1st or 2nd. A Saini (criminal tribe) named Gandu is said also to have been attacked, but recovered. It is also affirmed that when the Medical Officer came round to inspect the village, a substitute was shown him in the place of this man. The disease was discovered among the Chamars, and Jhandu, a Chamar, is said to have been in the habit of visiting a Chamar named Wazira, son of Kaku, at Mehlghahla, and to have sold him tobacco. Wazira had a brother also named, curiously enough, Jhandu, who died of plague at Mehlghahla. So the Jhandu of one village was the cause of the disease being taken by another Jhandu to the next village.

The weather was hot and dry, and the disease shewed very little tendency to spread. There were only 4 cases, which all occurred in the village. No fresh cases occurred after the village was evacuated. The disinfection had to be carried out with the utmost despatch, as the fields all round Bhaura are in the track of an occasional stream called the Bein and are all under water during the rains. Fortunately the whole village was re-occupied and declared free before this took place. There has since been no recrudescence of the disease.

(74).—BAHRWAL.

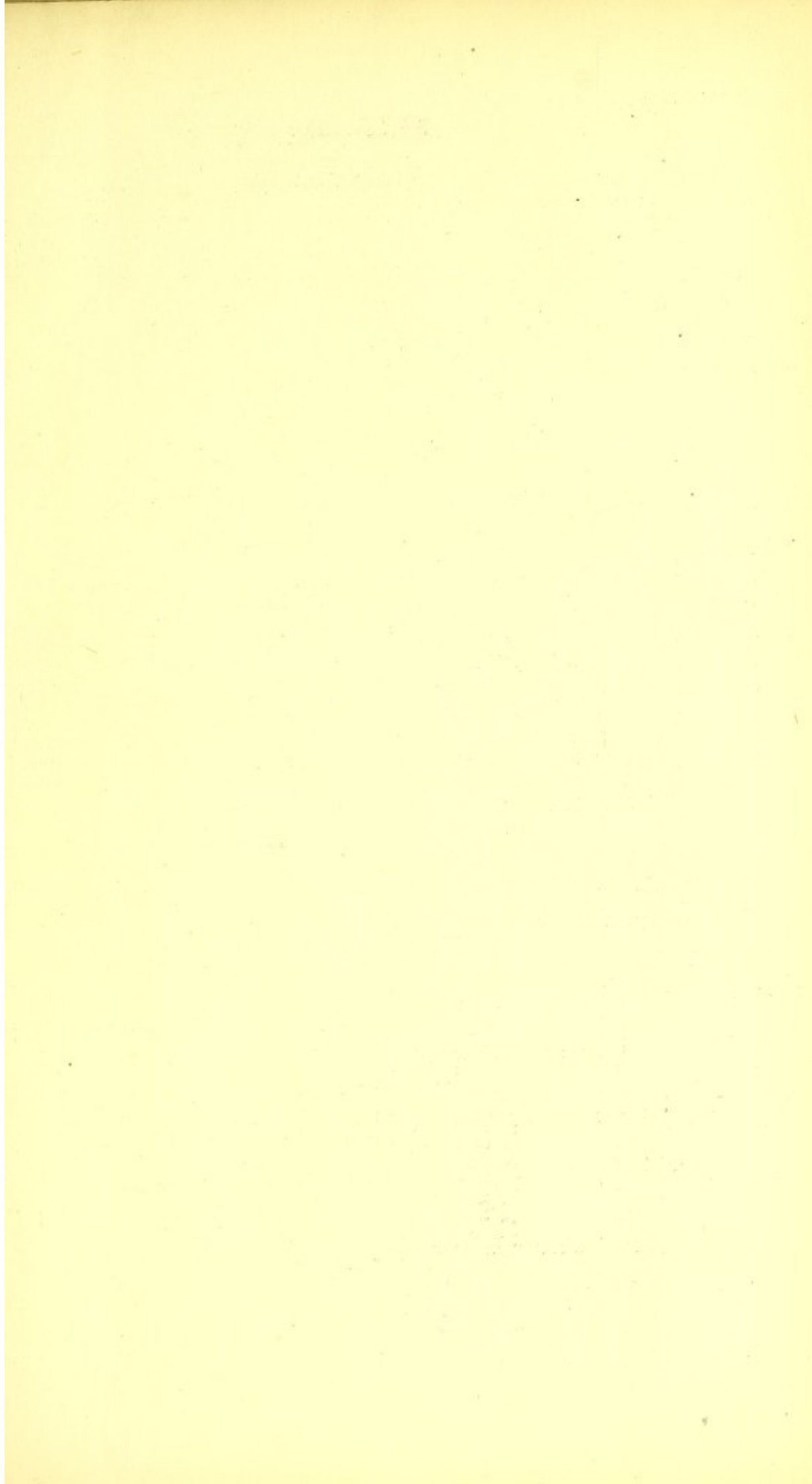
| | |
|---|-----------------|
| Census population (1891) | 778 |
| Roll call | 677 |
| Muhammadans | 54 |
| Hindus, chiefly Jats | 460 |
| Chamars and Ramdasis | 154 |
| Sweepers | 9 |
| Number of houses | 225 |
| Do. do. infected | |
| Do. plague cases returned | 1 |
| Do. deaths do. | |
| Do. recoveries do. | 1 |
| Date of first case | 22nd June 1898. |
| Do. do. returned | 23rd do. |
| Do. declaration of plague | 23rd do. |
| Do. cordoning of village | 23rd do. |
| Do. evacuation of village. (Not evacuated, only 19 persons placed in camp.) | |
| Do. commencement of disinfection | 4th July 1898. |
| Do. completion of do. | 5th do. |
| Do. last case | 23rd June 1898. |
| Do. return to village | 10th July 1898. |
| Do. removal of cordon | 12th do. |
| Do. village declared free of plague | 12th do. |

This was probably a case of re-infection. The village had previously been infected, evacuated, disinfected, and the people returned to their homes on June 2nd; the last case having occurred on 26th April (see page 39). On June 22nd the son of a barber was attacked. He had been in the habit of travelling about in the various infected villages, giving and receiving information of persons who had died. He had also received clothes worn by people who had died of plague. His house was situated in the village wall with its entrance outside the village, and not in a part previously affected by plague. His son, who had an extremely mild attack, made rapid and uninterrupted recovery, and the 19 persons placed in camp were allowed to return to their homes on July 10th. The barber's house, which was a double-storied one, was entirely unroofed during the disinfection.

The information concerning the following nineteen villages has been collected and tabulated by Surgeon-Captain E. Wilkinson. It will be seen that he has also attempted to trace the course of the disease from house to house in each village—a very careful and laborious piece of work. Some of his maps—those which do not give any particular information—are omitted; but all the more important ones are reproduced. These are more in the nature of diagrams, as they have not been drawn to scale, but they illustrate very well the relative positions to each other of the infected houses.

(8).—GUNACHAUR.

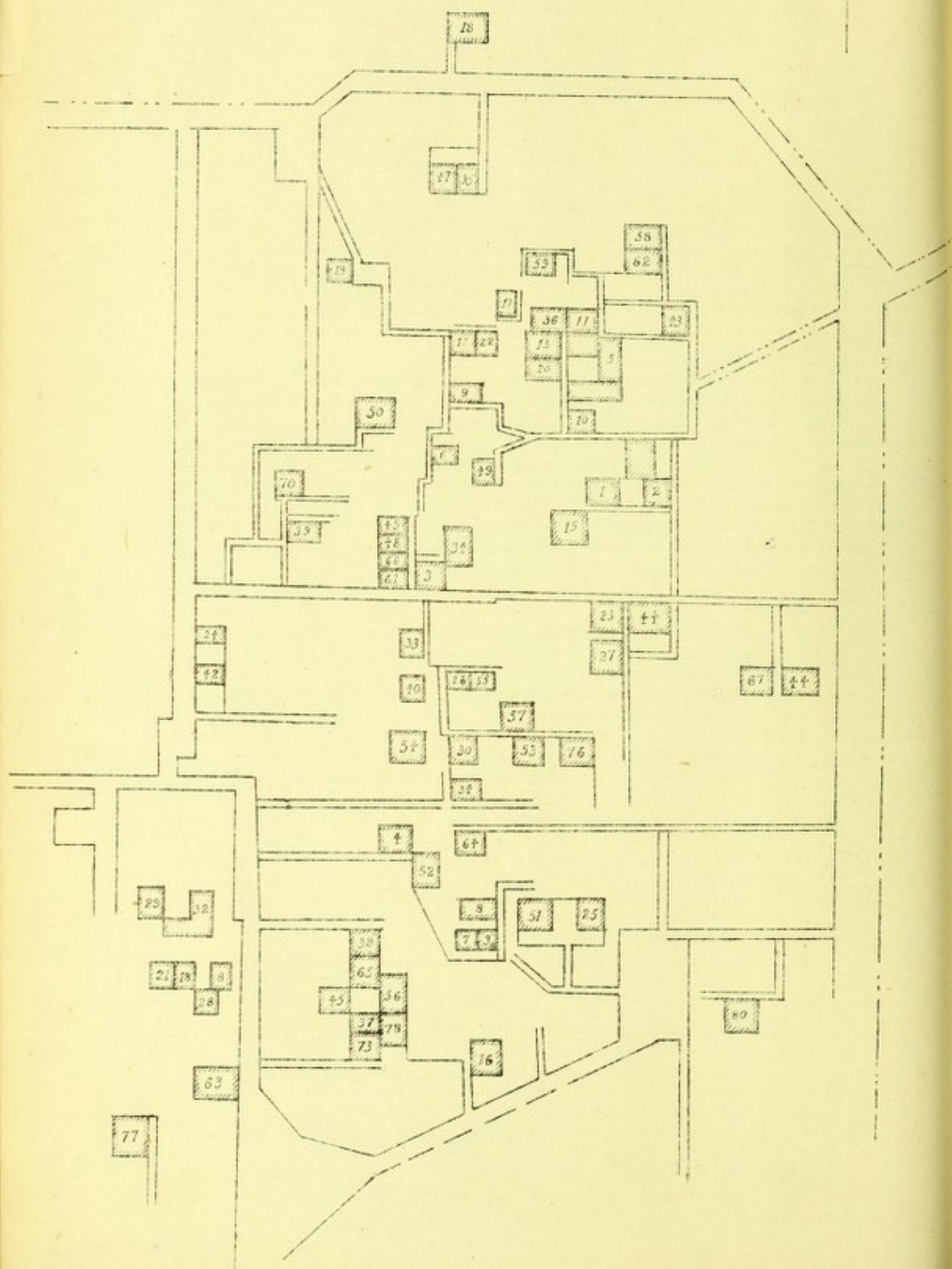
| | |
|--|--------------------|
| Census population (1891) | 3,614 |
| Roll call (March 1898) | 3,021 |
| Muhammadans, chiefly Arains and Rajputs | 1,727 |
| Hindus, all classes | 831 |
| Chamars | 310 |
| Sweepers | 140 |
| Ramdasis | 13 |
| Number of houses | 1,545 |
| Do. do. infected | 81 |
| Do. plague cases returned | 147, actual 156 |
| Do. deaths | 97 " 105 |
| Do. recoveries | 50 " 51 |
| Date of first case | 2nd February 1898. |
| Do. do. returned | 13th do. |
| Do. declaration of plague | 13th do. |
| Do. cordoning of village | 13th do. |
| Do. evacuation of do. | 1st March 1898. |
| Do. commencement of disinfection | 4th do. |
| Do. completion of do. | 31st May 1898. |
| Do. last case | 28th March 1898. |
| Do. return to village | 21st May 1898. |
| Do. removal of cordon | 31st do. |
| Do. village declared free of plague | 31st do. |



To face page 49.

MAP No. 8.

GONA CHAUR.



Owing to the great reticence of the people of Gunachaur, it has been exceedingly difficult to find out which really was the first case of plague which occurred in the village: there can be no doubt that cases occurred at least a fortnight before the disease was discovered, the names of 9 persons other than those recorded, who suffered from plague, have been ascertained and will be mentioned later.

The first case about which any exact evidence can be obtained was Khemi, wife of Kisben Singh, *dhobi*. This woman went to Sirhal Qazian, to arrange for the betrothal of her son, on January 25th. She stayed there in the house of Ditta, son of Dhanna Singh, *dhobi*, returning on January 27th. She was taken ill with "fever" on February 2nd and died the next day, having had a bubo in the groin. There was no illness in Ditta's house at Sirhal Qazian, but a person in the next house was ill with plague.

Two other persons of her family, eleven in number, were attacked on February 4th and 15th, respectively. Her house is marked (1) on the accompanying map and that next to it is marked (2). In this house dead rats were seen on February 3rd, and on that day Partabu, son of Lal Singh, *dhobi*, was attacked with plague, the remaining residents of the house being attacked on February 4th, 6th and 8th, respectively; none of these had left Gunachaur recently, nor had they known themselves to have been exposed to any source of infection.

There is a much less definite story about the wife of Iklas, Muhammadan Rajput. She is stated to have gone to Kotgarh a village in the Hoshiarpur district, on or about January 24th, while she returned on January 27th. On January 30th she went to Hadrabad, near Phagwara, returning the same day. She became ill on the way back with "fever," and died on February 3rd. She was driven in a *bail-ghari* by a man called Tapassi, son of Nihala: this man was also taken ill on January 30th and suffered from fever and a large swelling on the right side of the neck: he recovered. His mother, Rupan, was attacked with plague on March 1st; her house is marked (52) on the accompanying map.

The following numbers refer to the figures on the map, and the notes attached have reference to the method in which infection is thought to have been carried.

Manner of the spread of the disease in the village.

- (1) *Vide supra*.
- (2) Ditto.
- (3) Bulla, father of the patient Halima, bought straw from (2) while inmates were suffering from plague.
- (7), (8), (9). Dead rats were seen in all these houses four or five days previous to the patient being attacked; (7) is next to the *haweli* of (3).
- (11) Jini, wife of Harwa, had attended patients in (1) and (2).
- (17) Sahib Din was a beggar and often went into infected houses.
- (19) Mahtab, son of Shadi, *tehi*, is said to have bought cotton from house No. (6); this house is said to have been infected by straw from (4), but there is no history as to how this last became infected.
- (27) The 6 persons attacked in this house are thought to have become infected from the dead body of a son of the first case recorded in it (Nino) which was buried in the house.
- (41), (42) Got clothes from houses (2) and (1), respectively.
- (49) Budi, wife of Budda, is thought to have contracted plague pneumonia in hospital, but her mother Skina, wife of Atta Khan, died in this house on February 27th, after two days' illness, fever and delirium. Skina was a sister of Nino, house No. (44), who is supposed to have been infected from having attended Barkat in (9). When attacked the residents of (44) fled to (44 a), probably thus infecting (67).
- (52) Rupan, wife of Nihala—*vide* statement concerning the wife of Iklas, Muhammadan Rajput, *supra*.
- (79) Natha Singh was a *chaukidar* of Aur, but was sent to Gunachaur on duty: he is said to have taken things from infected houses, and it is stated that he visited Aur while on duty at Gunachaur.

Nothing definite is known about the infection of houses where numbers have not been mentioned above, though from the map it will be seen that many of them adjoin previously infected houses.

(13).—JAGATPUR.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|---------------------|-------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,729 |
| Roll call, February 1898 | ... | ... | ... | ... | ... | 1,500 |
| Hindús, chiefly Jats | ... | ... | ... | ... | ... | 862 |
| " Khatri and Brahmins | ... | ... | ... | ... | ... | 130 |
| Muhammadans, chiefly kamins | ... | ... | ... | ... | ... | 212 |
| Chamars | ... | ... | ... | ... | ... | 244 |
| Ramdasis | ... | ... | ... | ... | ... | 43 |
| Sweepers | ... | ... | ... | ... | ... | 9 |
| Number of houses | ... | ... | ... | ... | ... | 340 |
| Do. do. infected | ... | ... | ... | ... | ... | 40 |
| Do. plague cases | ... | ... | ... | ... | ... | 63 |
| Do. deaths | ... | ... | ... | ... | ... | 43 |
| Do. recoveries | ... | ... | ... | ... | ... | 20 |
| Date of first case | ... | ... | ... | ... | 21st February 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | 27th do. | |
| Do. cordoning of village | ... | ... | ... | ... | 27th do. | |
| Do. evacuation of " | ... | ... | ... | ... | 10th March 1898. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 12th February 1898. | |
| Do. completion do. | ... | ... | ... | ... | 10th May 1898. | |
| Do. last case | ... | ... | ... | ... | 13th April 1898. | |
| Do. return to village | ... | ... | ... | ... | 16th May 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | 22nd do. | |
| Do. village declared free of plague | ... | ... | ... | ... | 26th o. | |

The people of Jagatpur attribute the infection of their village both to Khankhanan and to Gunachaur.

They say that Hira Singh, son of Nagina, Jat, and his son Gurdit Singh went to Khankhanan on or about February 15th, to see one Harnam Singh there, to whom they are related, and in whose family certain persons had been attacked with plague.

They only stayed a day at Khankhanan, when they returned to Jagatpur bringing with them some clothes. Gurdit Singh was attacked with plague on February 21st, and Hira Singh himself was attacked some days later. It is also said that Partapi, wife of a younger son of Hira Singh, was attacked with plague the day after Gurdit Singh was, and died; but her case is not recorded.

This house is marked (1) on the accompanying map. The reputed infection from Gunachaur is attributed to Ram Jas and Kino, sons of Chartu, *lohar*, who are said to have gone to Gunachaur about the middle of February: a few days after their return Gangi, wife of Kisso's son, was attacked with plague and died, and Kisso himself afterwards died of plague. This house is marked (3) on the accompanying map, where it will be seen to be next (2), which is said to have been infected from (1), the residents of these houses being friends.

The houses on the map are numbered according to the sequence of their becoming infected: contiguity with other infected houses will explain the infection of many. The following notes contain such information as has been obtained concerning the spread of the disease, the figures referring to corresponding ones on the map. The only house about which any definite information about rats has been obtained is No. 39, in which a large number of dead rats was found when it was being disinfected; dead rats were also found in other houses, but in which has not been recorded.

(1), (2), (3) *Vide supra*.

(4), (6) Patients were servants in (1).

(7), (8) Relatives of (1).

(10) Adjoins (6).

(11) Relatives of (10).

(18) Patients, servants of (3).

(19) Patients several residents of (1), in segregation camp.

(23) Lehna, *teli*, combed cotton for families of (1) and (2).

(27) Gahia, *chamar*, worked in village in disinfecting gang.

(33), (35), (36) *Chamars* working at disinfection.

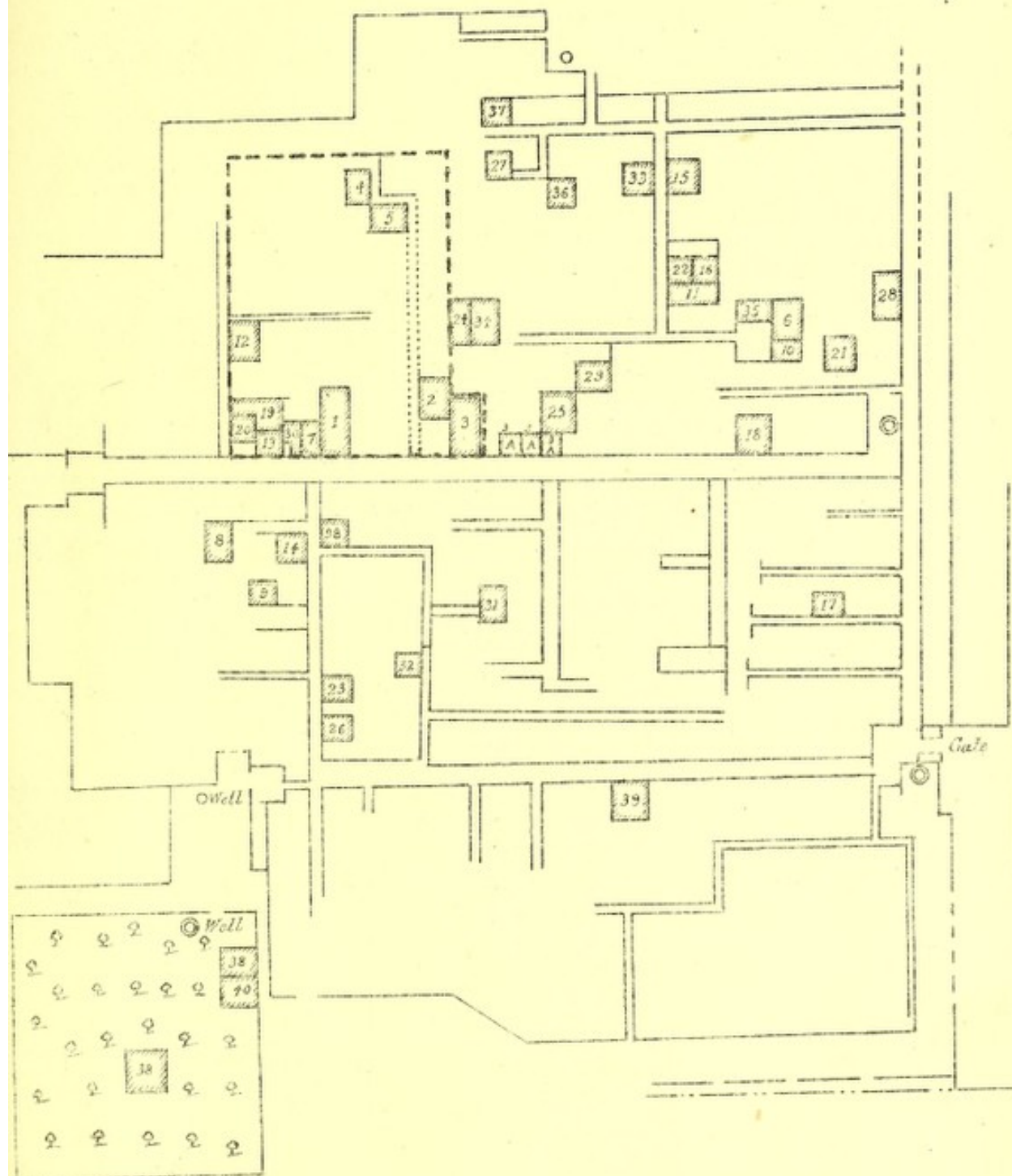
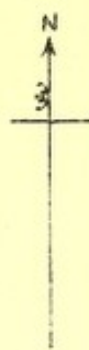
38 Patient entered village to get something from his shop. When he became ill he went to houses (38 a), and (38 b), in a garden outside the village, thus infecting Dalipa, who lived in (40).

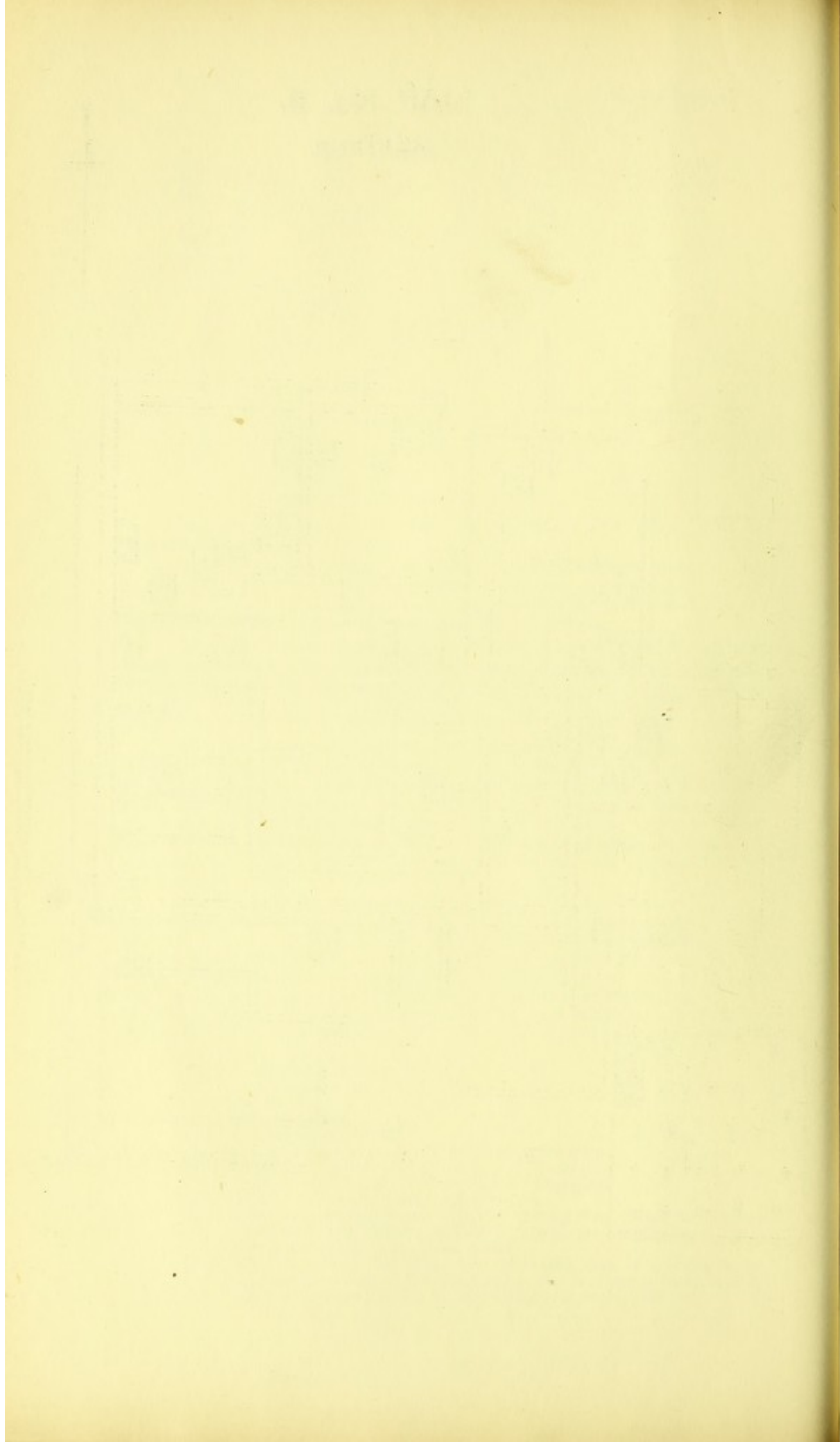
(39) This man entered the village from the healthy camp to get something from his house on March 30th; he found several dead rats in his house and threw them away: he was attacked with plague on April 6th.

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MAP No. 9.

JAGATPUR.

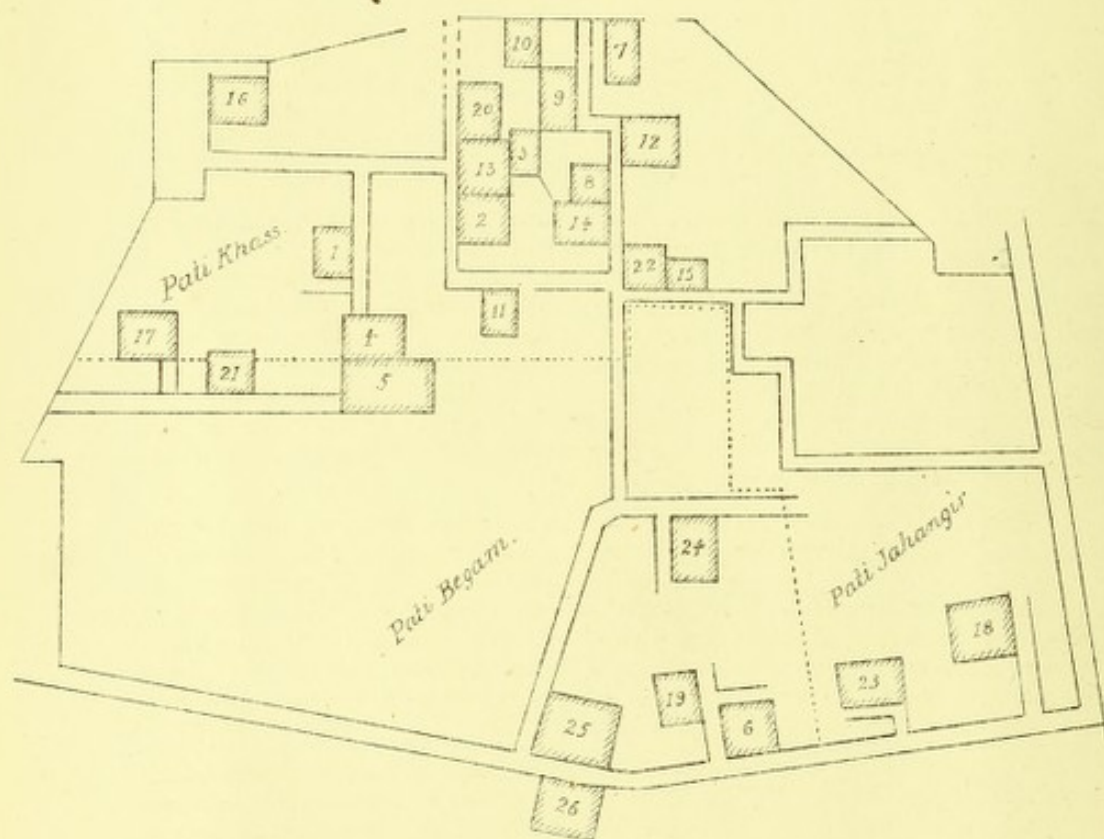
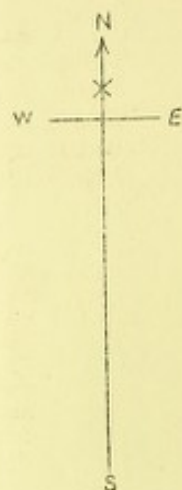




To face page 51.

MAP No. 10.

MASANI.



Note by Surgeon-Captain James.

An attempt was made at first to evacuate only a portion of this village on February 27th: 12 families who lived in the part enclosed by dotted lines in the map were placed in camp. They included 3 families of Jats, 1 Brahmin, 1 *sonar*, 3 *lohars*, 2 *jalahas*, 1 *kahar*, and 1 *chuhra* family. But as the disease continued to spread, the whole village was evacuated on March 10th.

(24).—MASANI.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------|---------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 1,380 |
| Roll call (March 1898) | ... | ... | ... | ... | ... | ... | 1,499 |
| Muhammadans, Rajputs and Arains | ... | ... | ... | ... | ... | ... | 901 |
| Sikhs | ... | ... | ... | ... | ... | ... | 62 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 162 |
| Chamars | ... | ... | ... | ... | ... | ... | 321 |
| Sweepers | ... | ... | ... | ... | ... | ... | 36 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 9 |
| Sahusis | ... | ... | ... | ... | ... | ... | 8 |
| Number of houses | ... | ... | ... | ... | ... | ... | 312 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 26 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 33, actual | 36 |
| Do. deaths do. | ... | ... | ... | ... | ... | 24, " | 26 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 9, " | 10 |
| Date of first case | ... | ... | ... | ... | ... | ... | 24th February 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | ... | 10th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 10th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 10th do. |
| Do. evacuation do. | ... | ... | ... | ... | ... | ... | 29th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. completion do. | ... | ... | ... | ... | ... | ... | 1st June 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 6th May 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 2nd June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 8th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 12th do. |

There can be little doubt that Masani was infected from Sirhal Qazian.

Mode of infection.

The villagers of Masani, and more particularly one Sundar, son of Khem Khaur, state that on or about February 23rd Chuhar, son of Fattah Khan and Nikka, son of Khem Khaur, both Rajputs, went to Sirhal Qazian to see Mamu, son of Mithu, Arain, in the segregation camp there. They returned the same day. Chuhar was taken ill the next morning, with high fever, and slight cough and delirium; he died on February 27th, but no report of his death was made. His house is marked (1) on the accompanying map: it is remarkable that, although he probably died of plague, none of the rest of his family, 6 in number, were attacked.

Nikka was attacked with high fever on February 28th; he soon became unconscious and died on March 3rd. While he was ill dead rats were found in his house, No. (2), and of the 10 other members of his family, 3 were attacked with plague and died. The first of these was Sikundar, son of Khem Khaur, who was taken ill on March 8th and died on March 9th. This was the first case reported, and the family was segregated on March 11th, when Khem Khaur and his wife were attacked with plague on March 13th and both died on March 15th.

After this family was segregated, no further case of plague occurred until March 27th, when Rulda, wife of Minal, Chamar, was attacked. Her husband took part in the disinfection of house No. (2), as did also Biru, son of Ratana another inmate, house No. (3). This family was segregated, and the village evacuated on March 29th.

The following notes contain such information as could be obtained regarding the spread of plague through the village. The figures have reference to the houses numbered on the accompanying map—

(1), (2), (3) *Vide supra*.

(4) Bhulli, wife of Sham, Gujar, attended patients in (2); her case is not recorded, but she is stated to have been taken ill on or about March 27th with slight fever and a bubo from which she recovered.

(5) Bhagwani, daughter of Gulab Singh, was attacked on March 31st. This house is next to (4), and Bhulli was a servant of the family; the dead rats were found in this house on March 29th.

- (6) Khemi, wife of Manglu, a Chamar, probably entered (2), but nothing definite known.
- (7) Gujar, son of Boota, Chamar, worked in (2).
- (8), (9) Chamars working in disinfecting gang.
- (11) Aisa, daughter of Jhanda, Arain, a friend of resident of 2, into whose house she often went. Dead rats were found here during disinfection. She was attacked on April 3rd and recovered, but her mother Rajan, who nursed her in hospital, was attacked on April 7th and died the next day.
- (12) Chamar working in disinfecting gang.
- (13) Friends of (2); houses adjoin.
- (15) Several dead rats found in this house: the patient Naimat went into the village from the camp to get things from her house several times.
- (17) Ishar Singh, son of Utam Singh, is a friend of resident of (5) and attended them when ill.
- (18) Thalu, son of Nihala, Chamar, attended Gaya, Chamar, when ill.
- (19) Same history as (18).
- (20) Achero, daughter of Nathu, sweeper; her father was employed in the plague hospital; she also occasionally worked there.
- 21) Ishar Singh, house No. (17), was the servant of this house.
- (23), (24), (25) Attack attributed to infection during the whitewashing of their houses.

(30).—TAHIRPUR.

| | | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|--------------|-----------|-----------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | ... | 531 |
| Roll call, March 1898... | ... | ... | ... | ... | ... | ... | ... | 523 |
| Sikhs | ... | ... | ... | ... | ... | ... | ... | 263 |
| Other Hindus | ... | ... | ... | ... | ... | ... | ... | 98 |
| Muhammadans | ... | ... | ... | ... | ... | ... | ... | 96 |
| Chamars | ... | ... | ... | ... | ... | ... | ... | 65 |
| Sweeper | ... | ... | ... | ... | ... | ... | ... | 1 |
| Number of houses | ... | ... | ... | ... | ... | ... | ... | 103 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | ... | 17 |
| Number of plague cases | ... | ... | ... | ... | Returned 31, | actual 32 | | |
| Do. deaths | ... | ... | ... | ... | " 22, | " 23 | | |
| Do. recoveries | ... | ... | ... | ... | " 9, | " 9 | | |
| Date of first case | ... | ... | ... | ... | ... | ... | 8th March 1898. | |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 18th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 18th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 18th do. | |
| Do. evacuation of village | ... | ... | ... | ... | ... | ... | 24th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 5th April 1898. | |
| Do. completion do. | ... | ... | ... | ... | ... | ... | 9th May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | ... | 9th April 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | ... | 3rd June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 9th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 13th do. | |

There is no very definite evidence as to how Tahirpur became infected with plague. The people of the village attribute their infection to one Devi Chand, son of Nagina Singh, who with his father went several times to Khankhanan while there was plague there, to see Nathu Singh, son of Khem Singh. This man lived in the healthy camp at Khankhanan, and none of his relatives had plague. Devi Chand and his father are reported to have brought back food and clothes from Khankhanan. Devi Chand was attacked with plague on March 10th, having high fever and bubo in the left axilla, and he died on March 16th. He was treated by a hakim, and no report was made of his illness or death. His house is marked (1) in the accompanying map.

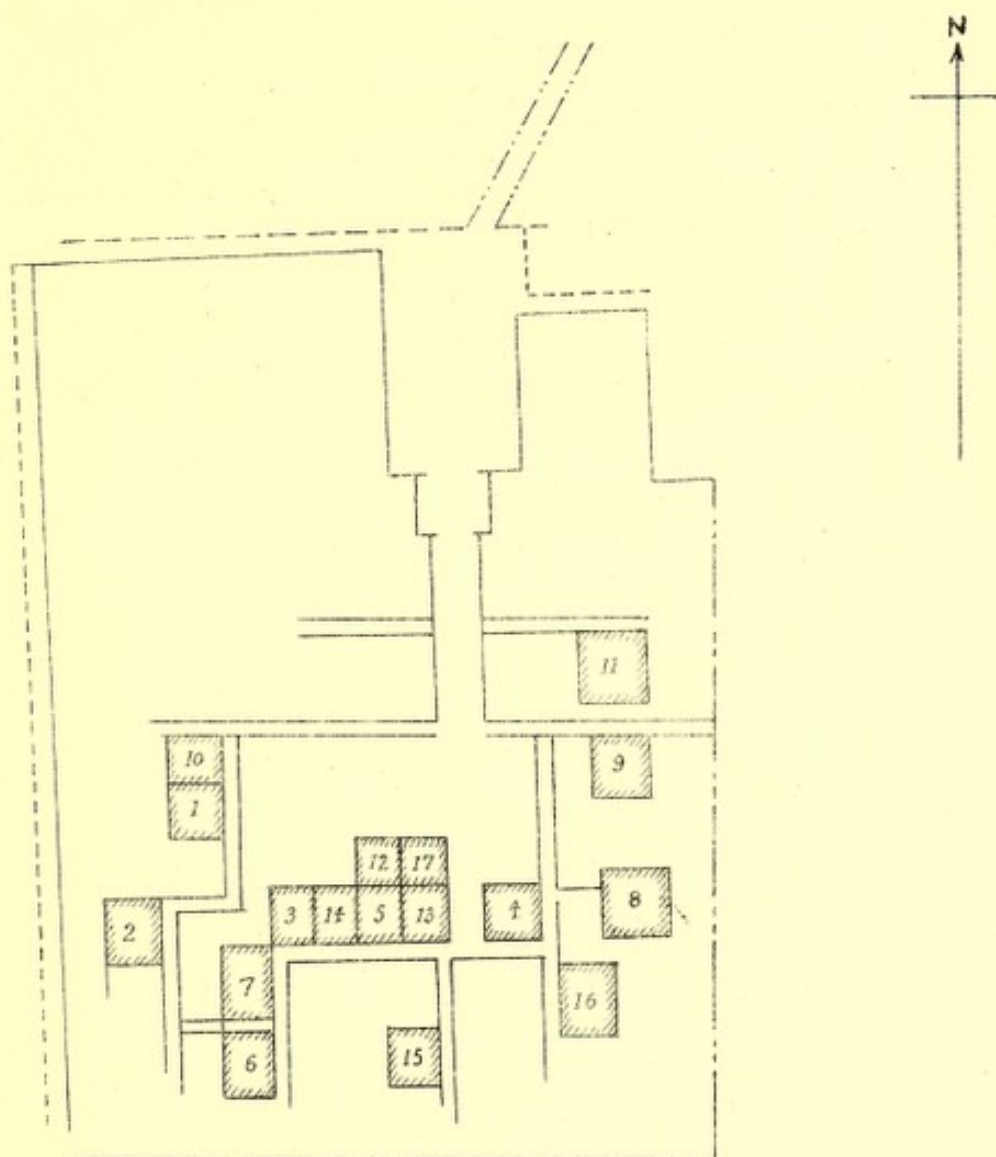
The spread in the village. The following numbers refer to the figures on the accompanying map:—

- (2) Thalu, wife of Ram Singh, nursed Devi Chand, and herself became ill on March 13th: no report of her illness was made until March 17th. Dead rats were found in this house on March 16th, and the fright caused by this discovery led to the report of Thalu's illness being made.
- (3), (4) Dead rats were found in these houses on March 16th.
- (12) Relatives of residents of (10).

To face page 52.

MAP No. 11.

TAHIRPUR.



1844

1844

1844

1844

(31).—MAZARA NAUABAD.

[illegible]

There is very definite evidence concerning the conveyance of the infection of plague to Mazara Nauabad. Ralli, daughter of Khana, Jat, was the wife of Ganga Ram, Jat, of Mahmudpur, and lived with him there. Ganga Ram died of plague on March 4th, and after the 13 days of mourning were over her father, Khana, came from Mazara Nauabad to fetch her, returning thither with her on March 19th. Ralli complained of headache on reaching home; undoubted plague manifested itself on March 21st, and she died on the evening of March 25th. She and her relatives were segregated on March 21st, and none of the latter contracted the disease.

Only 2 other cases of plague occurred in the village, both of them doubtful ones, one on March 25th, the other on March 27th, the day after which the village was evacuated. No infection can be traced to either of these cases; their houses adjoin, but both are distant from Ralli's.

The first of these two cases was Gurditta, son of Punjab Singh, aged 8; he became suddenly unconscious at 10 p.m. on March 25th and died in convulsions four hours later. He is said to have had fits before. His body was seen next morning, but the only indications of plague found were some slightly enlarged hard glands in the right axilla.

The second case, Watana, son of Shera, had fever and enlarged glands in both axilla, on March 27th, but he recovered in a few days.

(33).—SOTRAN.

| | |
|--|------------------|
| Census population (1891) | 308 |
| Roll-call (March 1898) | 304 |
| Sikhs | 154 |
| Other Hindus | 28 |
| Chamars | 101 |
| Muhammadans | 12 |
| Sweepers | 9 |
| Number of houses | 105 |
| Do. do. infected | 9 |
| Do. plague cases... .. | 17 |
| Do. deaths | 12 |
| Do. recoveries | 5 |
| Date of first case | 18th March 1898. |
| Do. declaration of plague | 24th do. |
| Do. cordoning of village | 24th do. |
| Do. evacuation of village | 24th do. |
| Do. commencement of disinfection | 15th April 1898. |
| Do. completion of do. | 10th May 1898. |
| Do. last case | 30th April 1898. |
| Do. return to village | 28th May 1898. |
| Do. removal of cordon | 3rd June 1898. |
| Do. village declared free of plague | 7th do. |

The infection of Sotran with plague is accounted for as follows :—Sukhi, wife of Gainda, Granthi, was a *fakirni*, and begged from the surrounding villages including Khankhanan from which she had received clothes before it was cordoned. On March the 8th or 9th she received some clothes from the house of her sister-in-law who lived in Pind Mazari in the Hoshiarpur District. On March 13th three or four rats were seen in her house, in a dying condition, staggering about as if they were drunk. She was attacked with plague on March 18th and died on March 24th. She lived outside the village in the *dharamsala* which is marked "1" in the accompanying map, and in this three of the remaining four of her family contracted plague.

The following brief notes contain such information as has been obtained regarding the spread of plague through the village, the numbers refer to corresponding ones on the accompanying map.

- (1). *Vide supra*.
- (2). Rai Kaur nursed patient Sukhi in 1 : dead rats found in house on March 22nd.
- (3). Dia Singh was a loafer who spent most of his time in the *dharamsala*, but took his meals and slept in this, his brother's, house : dead rats were found here on March 22nd.
- (4). Hira nursed Rai Kaur : dying rats found on March 23rd.
- (5). House next to (4) : dead rats seen March 23rd.
- (6). Maya, sweeper, was given clothes from (3).
- (7), (8), (9). No definite history, but all are known to have gone into the village to things out while in camp.

(36).—LIDHAR KALAN.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 671 |
| Roll-call, March 1898 | ... | ... | ... | ... | ... | ... | 672 |
| Hindu Jats | ... | ... | ... | ... | ... | ... | 252 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 220 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 49 |
| Chamars | ... | ... | ... | ... | ... | ... | 83 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 68 |
| Number of houses | ... | ... | ... | ... | ... | ... | 163 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 14 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 26 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 14 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 12 |
| Date of first case | ... | ... | ... | ... | ... | ... | 25th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 29th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 29th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 29th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 20th April 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 19th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 28th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 22nd May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 28th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 1st June 1898. |

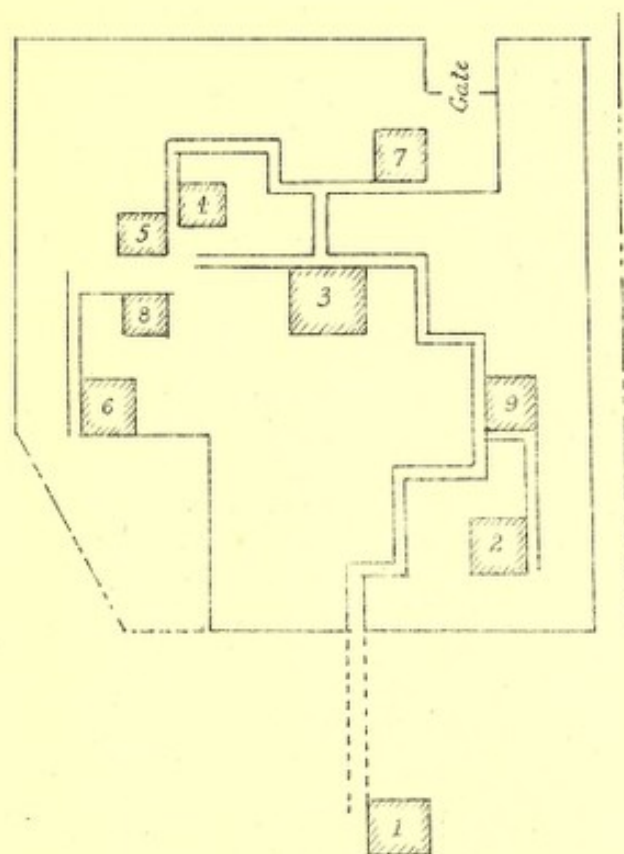
That infection was brought to Lidhar Kalan from previously infected villages will appear clear from the following statement, but owing to the many possible sources of infection it cannot be stated with any certainty from which village the infection was brought. The first case of plague at Lidhar Kalan was Balu, son of Bishen Das, Ramdasi fakir, who with his father went begging to several villages including Mazari and Jagatpur towards the end of March. On March 25th on the way back from Ladha Ganja, the boy was taken ill and his father carried him. The pair arrived thus at Lidhar Kalan, but the *chaukidar* seeing that the boy was ill refused them admittance, and they were made to stay in an open space about hundred yards from the village, whither necessities were brought to them by *chaukidar* Devi Das. Although the boy entered his house, marked "1" on the accompanying map, his brother, Bahman, was attacked with plague on April 9th, and died the next day.

On the very day that Balu was refused admittance to the village, March 25th, two other persons were attacked with plague, these were Mahtab Singh, Ramdasi, *chaukidar*, and his son, Pertab Singh. Mehtab Singh died on

To face page 54.

MAP No. 12.

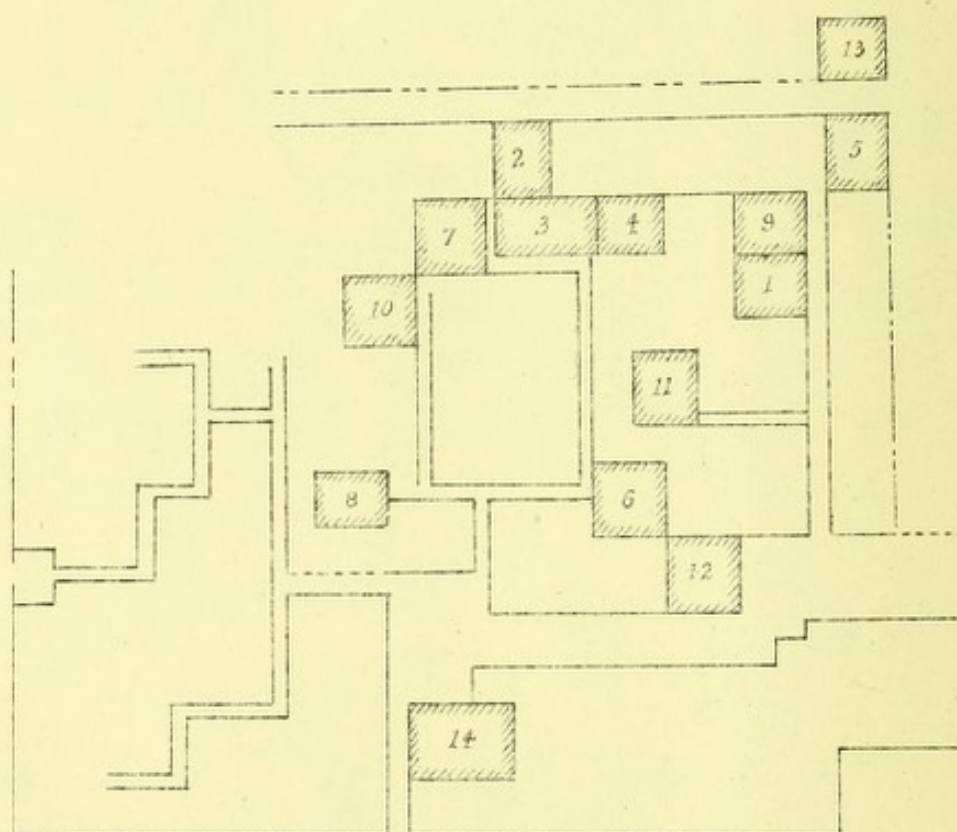
SOTRAN.



To face page 55.

MAP No. 13.

LIDHAR KALAN.



March 30th, but Pertab Singh, who is blind recovered. He says his father had often to go to other villages, and he had to take his chaukidar's books to Banga every week; he would have done so on March 26th had he not been taken ill the previous evening. On the way to, and from, Banga it was his habit to stop at villages he passed through, especially at Mallupota and Sirhal Qazian, where he had friends. He does not know if he had recently done so. Dead rats were found in his house ten days before he and his father were taken ill; this house is marked 2 on the map.

The figures below refer to similar ones on the map and the notes contain such information as could be obtained as to the spread of plague through the village.

Mode of spreading.

- (1) and (2). *Vide supra*.
- (3). Gopal, son of Utam, carpenter, states that ten days before the villages went into camp, that is, on March 19th, a dead rat was found in his house another was found a few days later. The back of his house adjoins I, but as will be seen by a reference to the map the houses are approached from different sides of the village. Gopal was taken ill on March 29th, and three of the remaining seven of his family were attacked on March 31st.
- (4). House adjoins (2). Ala Singh is a brother of Mehtab Singh.
- (5). Near (2): residents are relatives of patients in (1), and were frequently in the house.
- (6). Near the Ramdasi's houses.
- (7). House is near (4); residents are relatives. Jhandu frequently went in to (4).
- (8), (9), (12), (14). No history.
- (10). Dhunno used to get her food from the infected Ramdasi's houses.
- (11). Lohar Singh assisted in Mehtab Singh's funeral.
Constable No. 291, Khuda Bakhsh, son of Aman Bakhsh, Gurgaon District, was attacked with plague while on cordon duty at Lidhar Kalan on April 13th. He admits having gone into the village "to get something from a house."
- (13). The father of Jawali, Bhulla Chamar, worked in the disinfection gang.

(37).—KHANPUR.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 628 |
| Roll-call, (March 1898) | ... | ... | ... | ... | ... | ... | 618 |
| Jats | ... | ... | ... | ... | ... | ... | 288 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 81 |
| Muhammadans, chiefly Arains | ... | ... | ... | ... | ... | ... | 98 |
| Chamars | ... | ... | ... | ... | ... | ... | 148 |
| Sweepers | ... | ... | ... | ... | ... | ... | 3 |
| Number of houses | ... | ... | ... | ... | ... | ... | 130 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 11 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 22 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 15 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 7 |
| Date of first case | ... | ... | ... | ... | ... | ... | 27th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 30th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 30th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 1st April 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 12th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 12th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 26th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 22nd May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 28th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 1st June 1898. |

It is probable that Khanpur was infected simultaneously from two villages, Katharon and Dahan.

The first person to be attacked with plague in the village was Jamal Singh, son of Jowala Singh, who fell ill on March 27th. The day previous he, with his daughter-in-law Ralli, had gone to Katharon to see the girl's mother. They stayed the night there, and returned to Khanpur, taking with them some clothes: and shortly after reaching his house Jaimal Singh was taken ill. It is said that Ralli's brother, Gulaba, was given three months' imprisonment for breaking through the cordon at Katharon, Jaimal Singh's house is marked 1 on the accompanying map.

Mode of infection of village.

The same day that Jaimal Singh was taken ill, Thaba, wife of Hakim Singh, was attacked with plague. Hakim Singh, some four or five days previously had gone to Dahan, which was then cordoned, to see his wife's nieces, and he is said to have brought back some clothes from there. This house is marked 2.

The notes below contain such information as has been obtained about the spread of plague through the village, the figures referring to houses correspondingly numbered on the map.

(1) and (2). *Vide supra*.

(3). Close to (2): inmates of this house, (2) and (5) related.

(4). Next to (1): Kishni also went into (2), where she had relatives.

(5). Close to (2) and (3), with residents of both of which patients are related; its roof is continuous with that of (3).

(6), (7). Houses touching previously infected ones.

(8). The residents of this house are servants of (2), (3) and (5).

(9). The patient was a Grunthi, and was frequently in infected houses.

(10), (11). Patient used to come into segregation camp hospital.

(49).—BIKA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 320 |
| Roll-call (April 1898) | ... | ... | ... | ... | ... | ... | 353 |
| Hindu Jats | ... | ... | ... | ... | ... | ... | 162 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 55 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 30 |
| Chamars | ... | ... | ... | ... | ... | ... | 97 |
| Sweepers | ... | ... | ... | ... | ... | ... | 9 |
| Number of houses | ... | ... | ... | ... | ... | ... | 73 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 12 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 16 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 10 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 6 |
| Date of first case | ... | ... | ... | ... | ... | 9th April 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 10th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 10th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 10th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 20th do. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 10th May 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 17th do. | |
| Do. return to village | ... | ... | ... | ... | ... | 11th June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 17th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 21st do. | |

No very good evidence has been obtained as to how Bika became infected:

the people, however, say that Ganga, son of Vadhava Singh, the first case to be attacked, had been to several villages in which there was plague, mentioning especially Mazara Nauabad and Shikohpur. He went to the latter place shortly before he became ill, April 9th, and stayed with his sister Pertapi, wife of Dhem, bringing back some clothes with him to Bika. It is said that Pertapi's house was close to infected houses, but that nobody in her house was attacked with plague. Ganga's house is marked 1 on the accompanying map, and it will be seen that the infection seems to have spread from it. No dead rats were found in it, though these were in other houses subsequently infected.

Mode of spreading in the village.

The following notes refer to houses with corresponding numbers on the map.

(1). *Vide supra*.

(4). The residents are friends of Ganga, and were often in his house: two dead rats were found in this house on April 10th.

(3). House touching (4): four dead rats found here on April 10th, and several more during the disinfection of the village.

(2). House touches (4): residents of both related.

(5). House touches (4): patients in all the houses numbered (2), (3), (4) and (5) were attacked on the same day, April 14th.

(6). Bana attended Ram Singh in hospital: house close to infected ones.

(7). Bunno attended Bana.

(8). Ganga Singh was attacked the day after he went into the village to get something from his house.

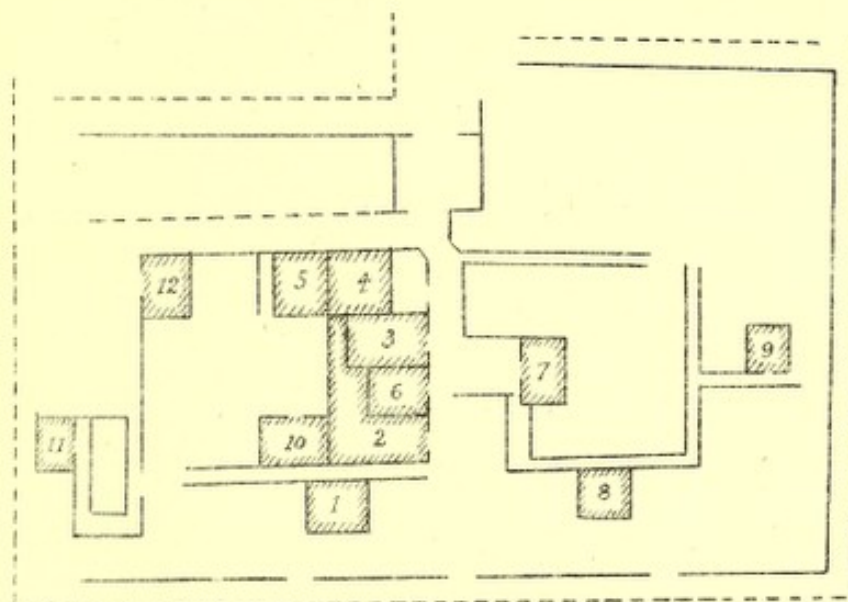
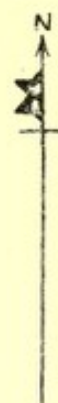
(10). House next (2): three dead rats found here on April 10th.

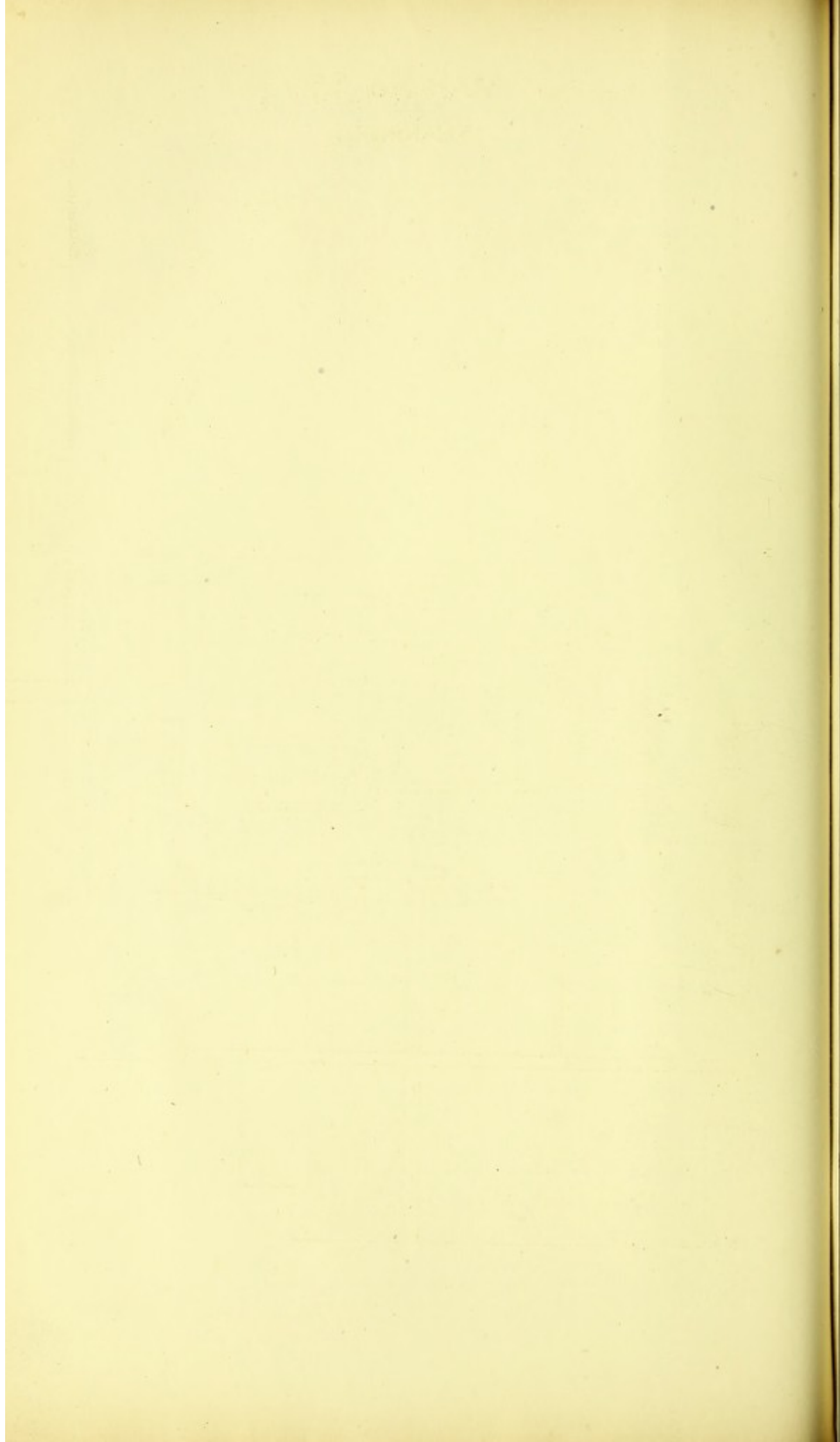
(11), (12). Patients were Chamars working in the disinfecting gang: father of patient in (4).

To face page 56.

MAP No. 14.

BIKA.

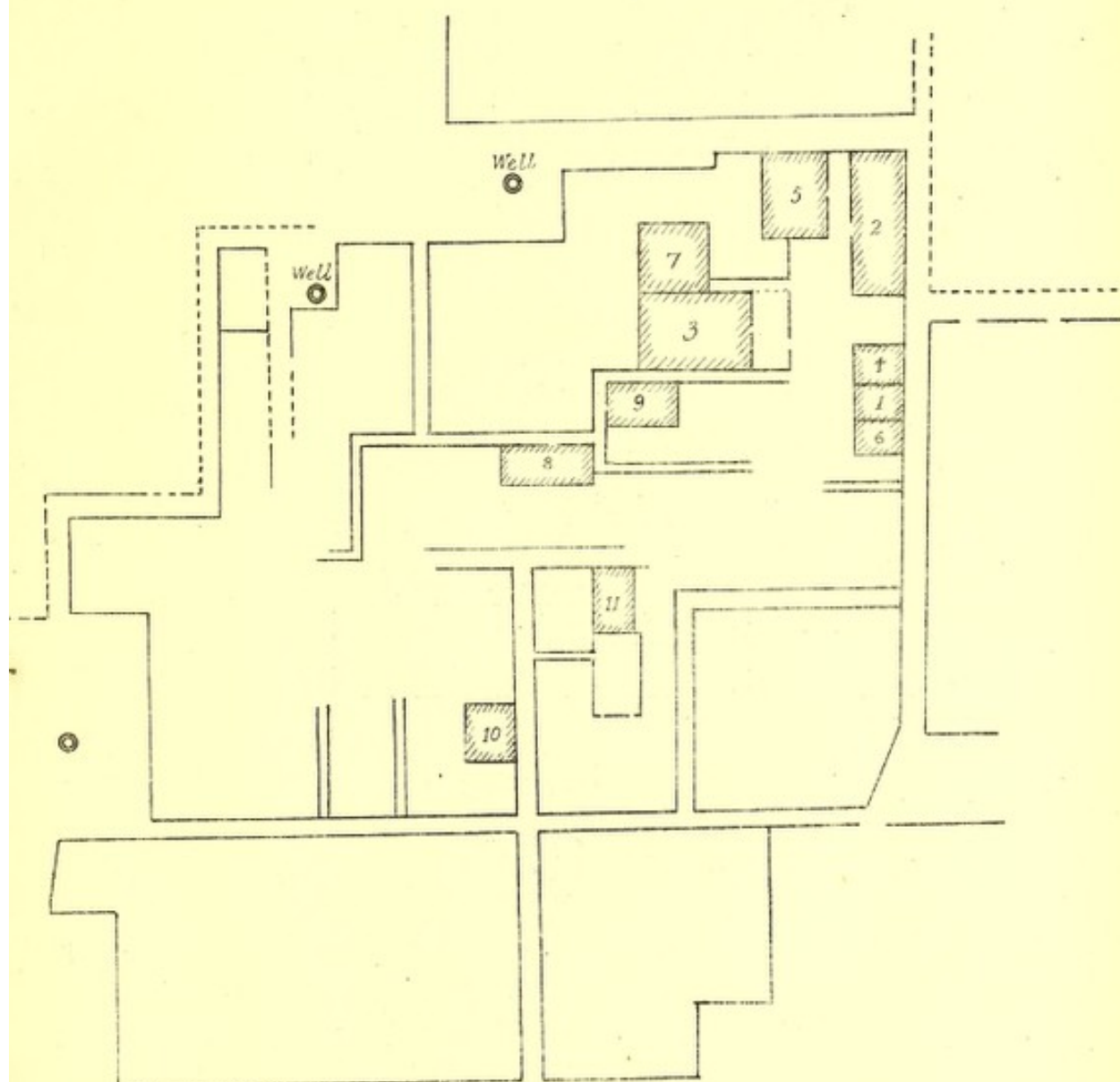




To face page 56.

MAP No. 15.

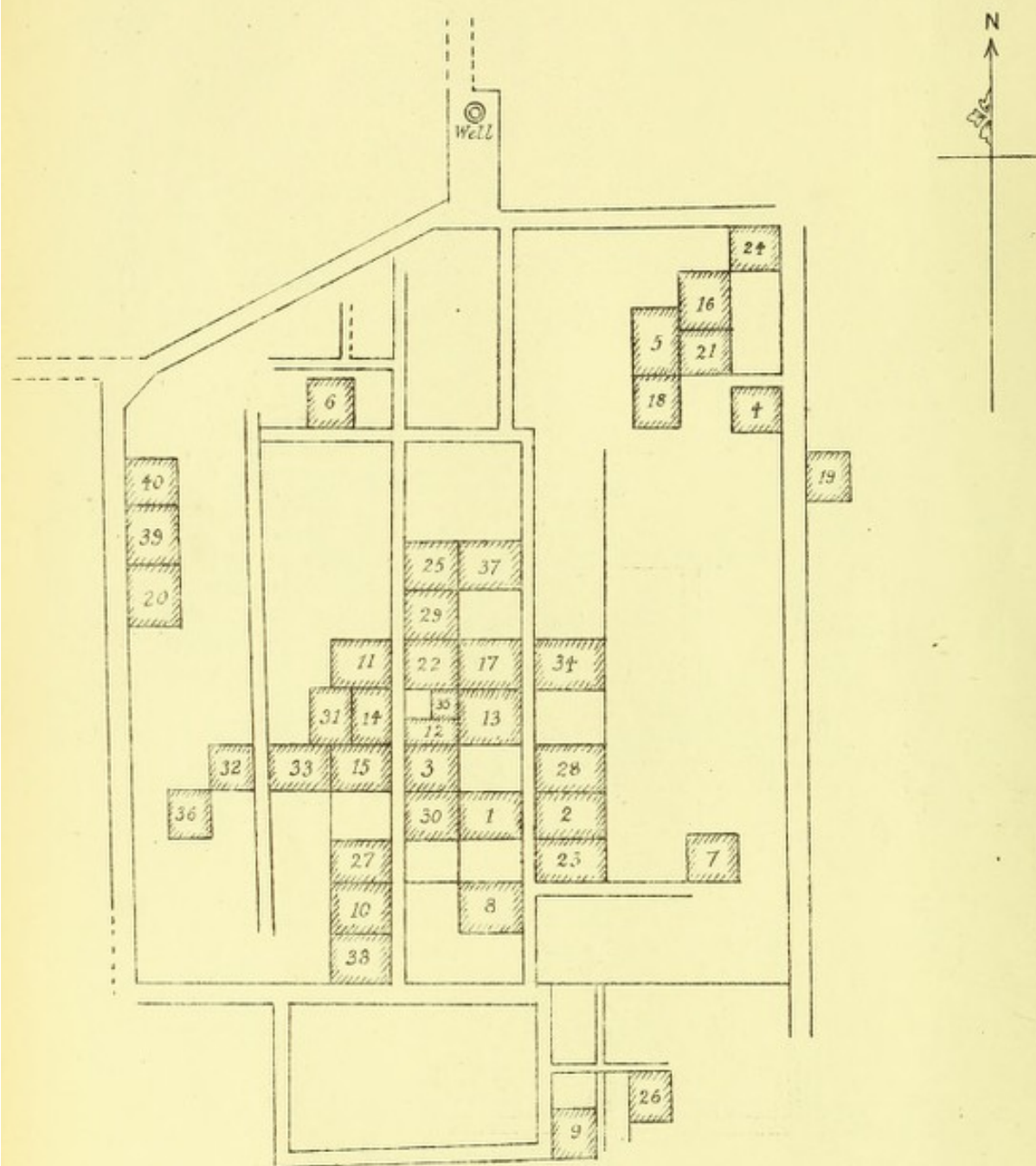
KHANPUR.



To face page 57.

MAP No. 16.

SIRHAL MANDI.



(51).—SIRHAL MANDI.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 851 |
| Roll-call, (May 1898) | ... | ... | ... | ... | ... | ... | 943 |
| Hindu Rajputs | ... | ... | ... | ... | ... | ... | 312 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 171 |
| Muhammadans, Arains | ... | ... | ... | ... | ... | ... | 211 |
| Do. others | ... | ... | ... | ... | ... | ... | 129 |
| Chamars | ... | ... | ... | ... | ... | ... | 63 |
| Sweepers | ... | ... | ... | ... | ... | ... | 26 |
| Sahnsis | ... | ... | ... | ... | ... | ... | 16 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 15 |
| Number of houses | ... | ... | ... | ... | ... | ... | 242 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 40 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 57 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 34 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 23 |
| Date of first case about | ... | ... | ... | ... | ... | ... | 13th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 14th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 15th do. |
| Do. completion do. | ... | ... | ... | ... | ... | ... | 2nd June 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 15th May 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 6th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 12th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 16th do. |

The people of Sirhal Mandi attribute their infection with plague to Tahirpur, which is only separated from their village by a narrow lane, and in which plague had been previously existing for some weeks.

This, however, is a revised opinion, for when the first case of plague occurred in their village they refused to go out into camp because they did not consider that plague was in any way an infectious disease. Acting on this opinion they stayed in their village, and mixed freely with persons suffering from plague for nearly three weeks, when, either because they had altered their opinion, or because they feared other consequences they came out into camp; it is interesting to note that only two of these fifty-seven cases occurred after they had left the village.

These statements, together with a reference to the accompanying map will explain how the disease spread through the village. The people say that while they were in the village rats died in every house, and that during the disinfection over a maund of dead rats were found in the village.

Most of the infected houses form a large group in the middle of the village. Of the outlying houses the following brief notes have been obtained:—

- (4), (5). Houses of chamars, who had worked in infected houses.
- (6), (20). Houses of poor Arains who had acted as servants, in houses of Hindu Rajputs, while they were infected.
- (7). House of a beggar who wandered all through the village.
- (9). House of the only dhobi in the village: he washed infected clothes.
- (19). Worked in house No. (13).
- (26). House of a teli who had worked in infected houses.

(53).—MOKANDPUR.

| | | | | | | | |
|---------------------------|-----|-----|-----|-----|-----|-----|---------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 3,348 |
| Roll-call, (April 1898) | ... | ... | ... | ... | ... | ... | 3,045 |
| Jats | ... | ... | ... | ... | ... | ... | 491 |
| Brahmins | ... | ... | ... | ... | ... | ... | 419 |
| Khatri and Banias | ... | ... | ... | ... | ... | ... | 305 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 464 |
| Muhammadans, Arains | ... | ... | ... | ... | ... | ... | 236 |
| Do. others | ... | ... | ... | ... | ... | ... | 619 |
| Chamars | ... | ... | ... | ... | ... | ... | 292 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 115 |
| Sweepers | ... | ... | ... | ... | ... | ... | 104 |
| Number of houses | ... | ... | ... | ... | ... | ... | 1,219 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 12 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 15, actual 17 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 7 „ 8 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 8 „ 9 |

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------------------|
| Date of first case | ... | ... | ... | ... | 9th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | 14th do. |
| Do. cordoning of village | ... | ... | ... | ... | 16th do. |
| Do. evacuation of mohallas | ... | ... | ... | ... | 16th April and 4th May 1898. |
| Do. do. whole village | ... | ... | ... | ... | 10th May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | 25th do. |
| Do. completion | do. | ... | ... | ... | 13th June 1898. |
| Do. last case | do. | ... | ... | ... | 10th May 1898. |
| Do. return to village | ... | ... | ... | ... | 13th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | 21st do. |
| Do. village declared free of plague | ... | ... | ... | ... | 23rd do. |

The people of Mokandpur accuse Maula, son of Jai Dial, Khatri, of having brought plague to their village. They say that he used to bring sugar from Lalpur and Khankhanan, the latter place especially, but not while either of these villages were cordoned. This man was certainly the first person to be attacked with plague in Mokandpur, but there was another possible source of infection. It appears that on April 2nd a Nai, Basanta, son of Chajju, came from Bilron, and in spite of the watch the people of Mokandpur had set on their village to prevent strangers entering, he managed to get into the shop of Sibhu, son of Dosaundi, Khatri, shown as "1" on the accompanying map. This Nai had left Bilron on horseback the day the cordon was removed from that village to take message from one Kharak Singh, Bedi, of Bilron, to his two daughters, one of whom lived at Apra, the other being the wife of Prebhu, son of Dosaundi, brother of Sibhu mentioned above.

It is said that the people of Apra, noticing that the nai looked ill, refused him admission, fearing plague, upon which he rode on to Mokandpur, arriving there late in the evening. It is further stated that Sibhu took the man into his shop and poulticed a swelling he had in the groin, and prevailed upon Maula to let him sleep in his shop, saying that he had brought a message about a suitable wife for his son. Maula's house is marked (2) on the map. This nai only stayed a night at Mokandpur, when he returned to Bilron, leaving behind him some clothes he had brought for Prebhu's wife.

Dead rats were found in Sibhu's shop on April 3rd, and in the street outside the shop. He lived in another house marked (4) on the accompanying map where his sister, Raji, was attacked with plague on April 10th, and he himself on April 17th. It is said that when this house was being disinfected nearly 200 dead rats were found in it. During the disinfection of the village dead rats were found in many houses in which there had been no cases of plague, and in the streets. The people say that there is not a single rat in the village now; they say they are in the neighbouring fields, but nothing will induce them to come into the village, even though corn is scattered for them. They also state that many dogs died in the village before the people left it.

A certain number of persons at Mokandpur formed themselves into a sort of "Plague Committee," when Khankhanan was first attacked, with the object of trying to prevent the plague attacking their villages. They visited and inspected houses, and made the chaukidars responsible for reporting to them every case of sickness in their respective *pattis*. They also had the village cleaned, and made a *chanda* for the payment of special chaukidars whom they appointed to prevent strangers entering the village and for the provision of medicines, &c., for the sick and food for the poor. When the plague broke out they appointed their own hakim with a paid assistant and a bhisti, cook and sweeper for the hospital; the only Government servant employed in the treatment of their sick was a *dhai*.

The following notes have been obtained about the spread of plague through the village, the figures referring to similar ones on the map.

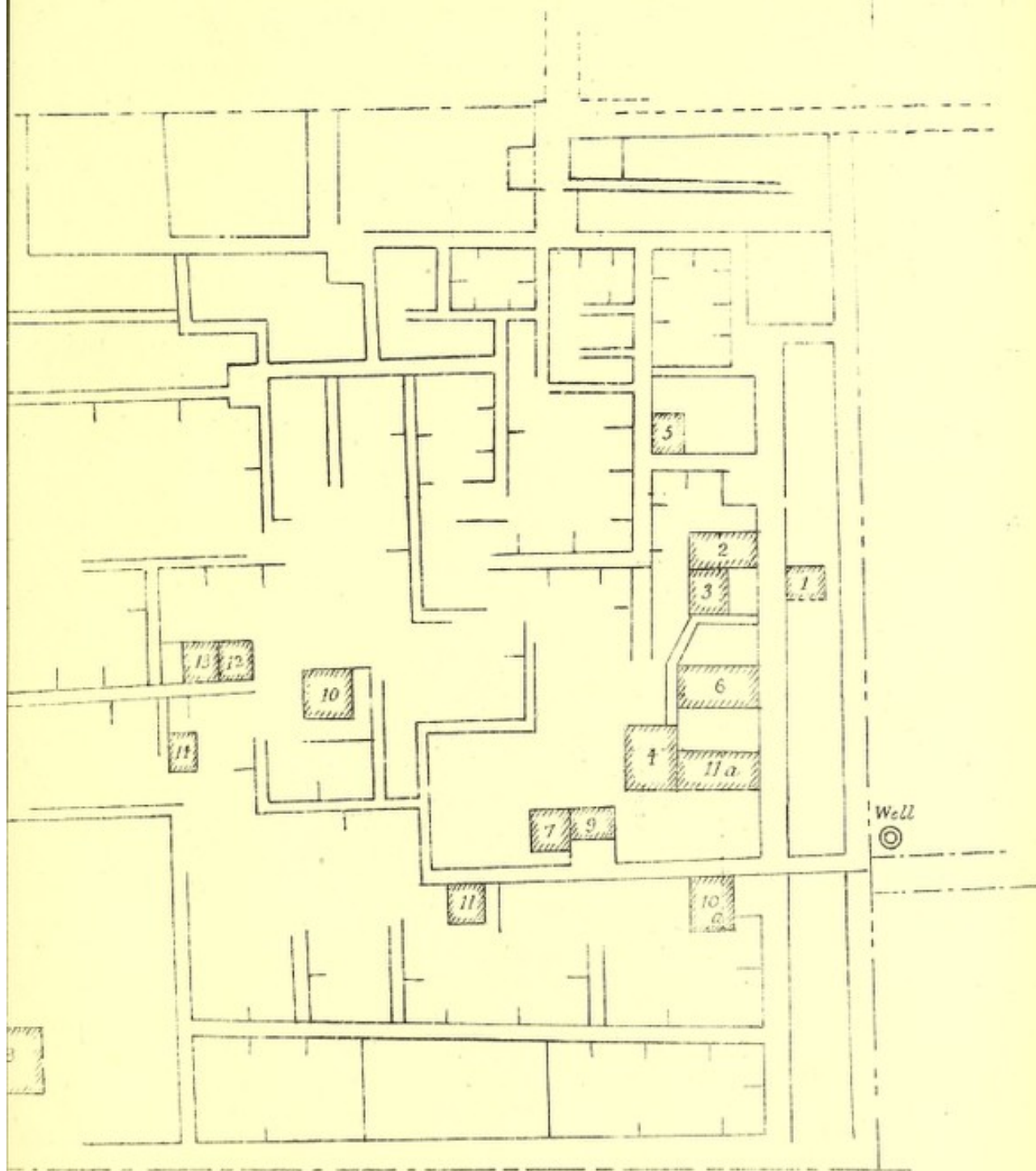
(1), (2), (4). *Vide supra*.

(3). House next to (2): no dead rats were found here, but there was a very bad smell in the house when she was taken ill.

To face page 30.

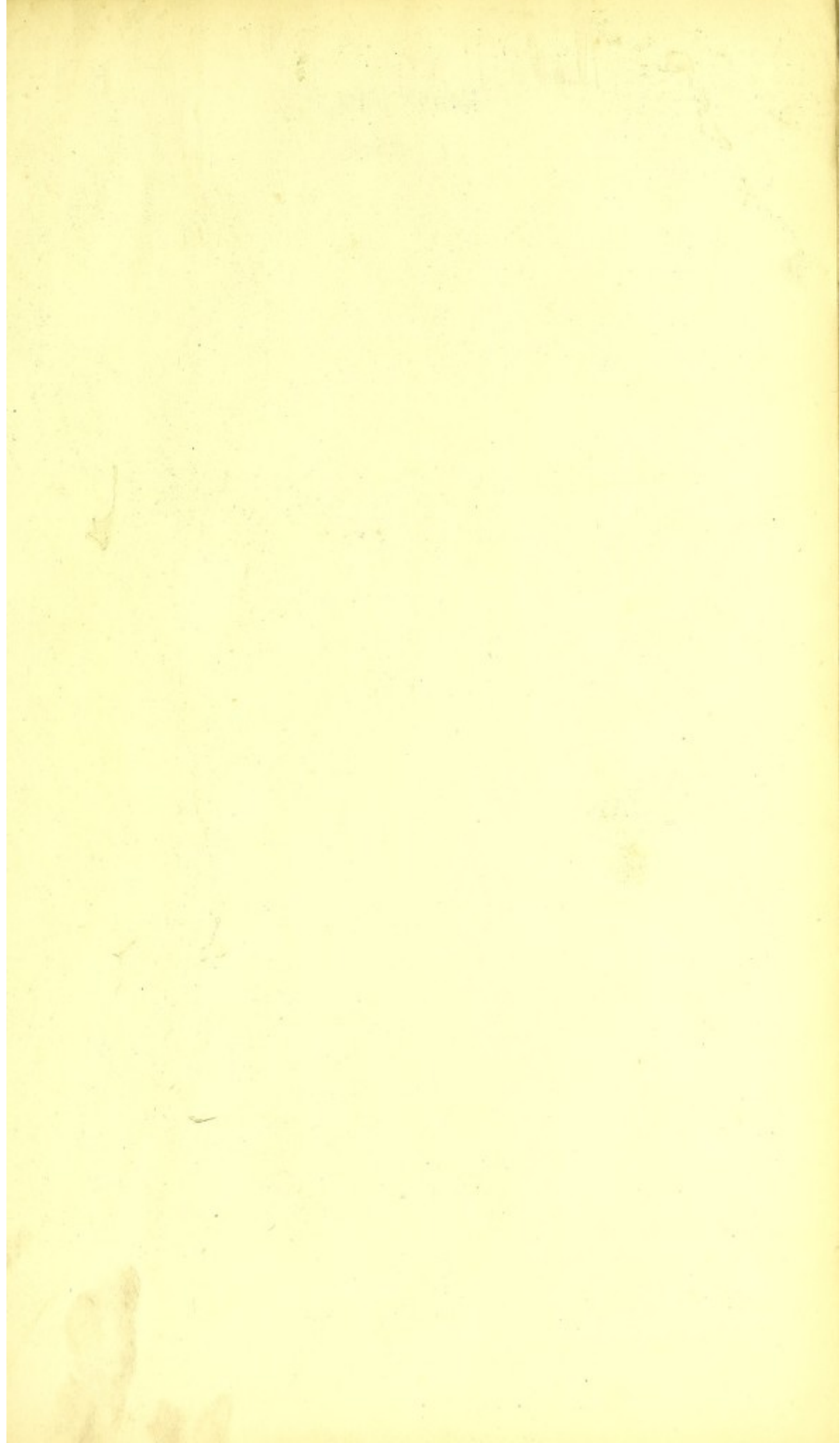
MAP No. 18.

MOKANDPUR.



37

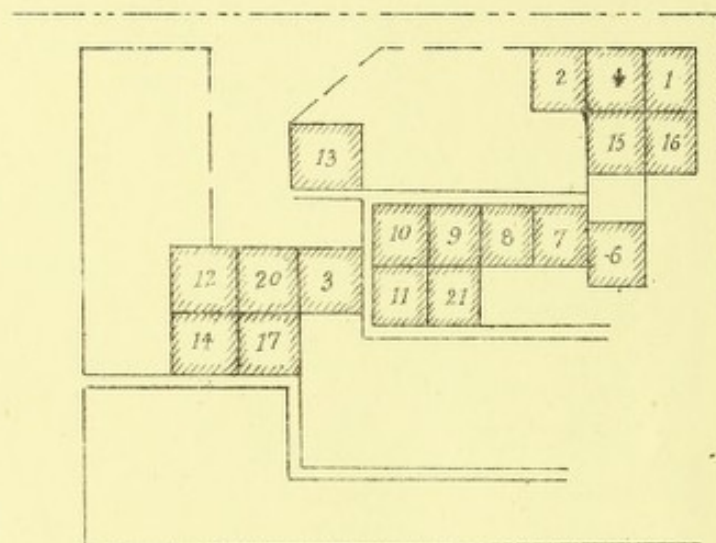
1870



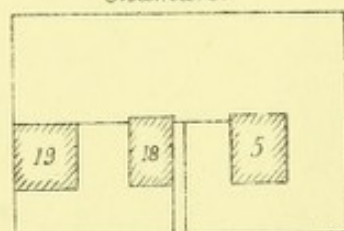
To face page 59.

MAP No. 17.

LEHL.



Chamars.



- (5). Sina, son of Jai Dial, is brother of Maula, mentioned above. The brothers share this house and Maula took his meals in it. Sixteen or seventeen dead rats were found in this house when they removed their things to camp.
- (6). No special history except that the patient Rupa constantly played in shops (1) and (2).
- (7). Chuni, son of Gulab, nai, was a servant of residents of (1) and (4).
- (8). Jatani, daughter of Nihala, sweeper, was a servant in house (4), which she swept out and removed filth, &c., from it.
- (9). House next to (7): a rat was seen to stagger out of this house and die in the street two days before the patient was attacked.
- (10). Ram Chand, lohar, is said to have been infected by Nathu, a resident of (9), who constantly sat in his workshop, (10a).
- (11). Residence of Thakur, Brahmin, whose shop (11a) is next (4).
- (12), (13). Infected by Thakur, who is their *parohit* and frequently comes into their houses.
- (15). History same as (12) and (13): many dead rats were seen here the day before the patient was taken ill.

(55).—LEHL.

| | | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | ... | 487 |
| Roll-call (April 1898) | ... | ... | ... | ... | ... | ... | ... | 501 |
| Jats | ... | ... | ... | ... | ... | ... | ... | 250 |
| Other Hindus | ... | ... | ... | ... | ... | ... | ... | 121 |
| Chamars | ... | ... | ... | ... | ... | ... | ... | 122 |
| Muhammadian Telis | ... | ... | ... | ... | ... | ... | ... | 8 |
| Number of houses | ... | ... | ... | ... | ... | ... | ... | 121 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | ... | 21 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | ... | 34 |
| Do. deaths | ... | ... | ... | ... | ... | ... | ... | 18 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | ... | 16 |
| Date of first case | ... | ... | ... | ... | ... | ... | 12th April 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 17th " | |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 17th " | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 18th " | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 10th May 1898. | |
| Do. completion do. | ... | ... | ... | ... | ... | ... | 26th " | |
| Do. last case | ... | ... | ... | ... | ... | ... | 13th " | |
| Do. return to village | ... | ... | ... | ... | ... | ... | 31st " | |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 31st " | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 31st " | |

Very little reliable information of a definite character has been obtained

concerning the spread of plague to Lehl, owing to the reticence of the inhabitants. They all say that they were infected from Sirhal Mandi with which they had free communication. Dead rats were seen in several houses

before anybody was attacked; first in the house of Nihal Singh and Sham Singh, marked (1) and (2), respectively, on the accompanying map. They were seen in these houses about April 10th, "three or four days before Baisakh"; persons were attacked in (1) on April 12th and in (2) the next day.

It will be seen on the map that the infected houses, numbered in accord-

ance with the date on which their inmates were first attacked, are nearly all close together.

The chamars live in a collection of houses quite separate from the village, and it is stated that the patient in the first of these houses to be attacked, (5) on the map, was infected at Sirhal Mandi, as she was taken ill on her way back from there.

Dead rats were found in (3) and (8) on April 13th and in (4) on April 17th. No definite information could be obtained about other houses.

The patients attacked in (18) and (19) were chamars working in the disinfecting gang.

Constable No. 350, Hakim Beg, Jullundur District, was attacked with plague at Lehl while on cordon duty on May 10th, and died on May 14th. He came into the segregation camp.

Police constable attacked.

(56).—CHAK KALAL.

| | |
|--|------------------|
| Census population (1891) | 315 |
| Roll-call, (April 1898) | 246 |
| Kalals | 123 |
| Other Hindus | 62 |
| Chamars | 60 |
| Muhammadian | 1 |
| Number of houses | 80 |
| Do. do. infected | 18 |
| Do. plague cases | 33 |
| Do. deaths | 20 |
| Do. recoveries | 13 |
| Date of first case | 17th April 1898. |
| Do. declaration of plague | 17th do. |
| Do. cordoning of village | 17th do. |
| Do. evacuation of do. | 5th do. |
| Do. commencement of disinfection | 8th May 1898. |
| Do. completion do. | 31st do. |
| Do. last case | 27th April 1898 |
| Do. return to village | 4th June 1898. |
| Do. removal of cordon | 10th do. |
| Do. village declared free of plague | 14th do. |

The people of Chak Kalal state that on April 4th or 5th they noticed dead rats in several houses in different parts of the village, and reported this to Mr. Johnston, who advised them to leave the village at once, which they did, leaving most of their property in their houses.

The rats first affected.
The people go into camp before any one is attacked.

A few days later a dying rat was found in the *dicankhana* of the village and was brought to Dr. James, who examined it and found the characteristic bacilli of plague in its greatly enlarged spleen.

On April 15th there was a heavy shower of rain and most of the people returned to the village. The first case of plague occurred on April 17th, and thirty-three persons were attacked between that date and April 27th.

The people became attacked on their return to the village.

The houses on the accompanying map are numbered with reference to the date on which their residents were first attacked with plague, though, as will be seen from what has been written above, all the patients were attacked while in camp.

The distribution of the "infected" houses in the village.

In addition to what has been recorded above it is stated that on March 24th, Uttam Singh, son of Dalel Singh, Kalal, brought over clothes from the *dharamsala* of Sotran, to which place he was in the habit of going. There was plague in the *dharamsala* at the time and Sotran was cordoned the next day.

Uttam Singh was reported to Dr. James, who segregated him for ten days and disinfected him and the clothes he brought from Sotran; it is said, however, that he had previously given some of the clothes to other persons in the village. Neither he nor any of his family were attacked with plague.

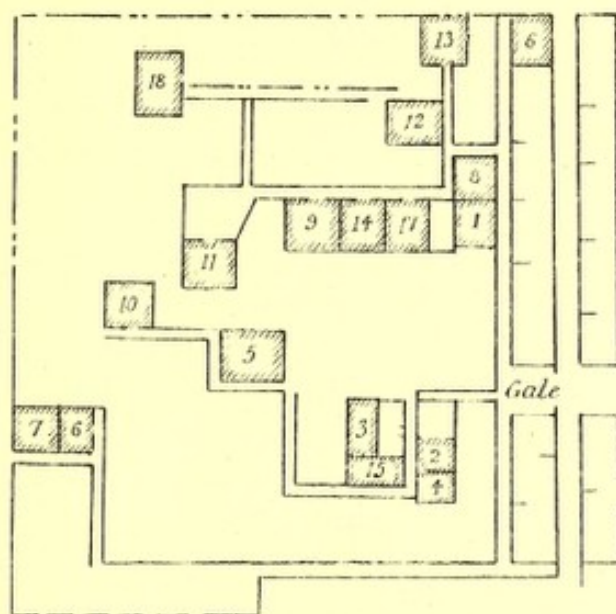
A history of clothes brought from Sotran, but none of the people keeping these became attacked.

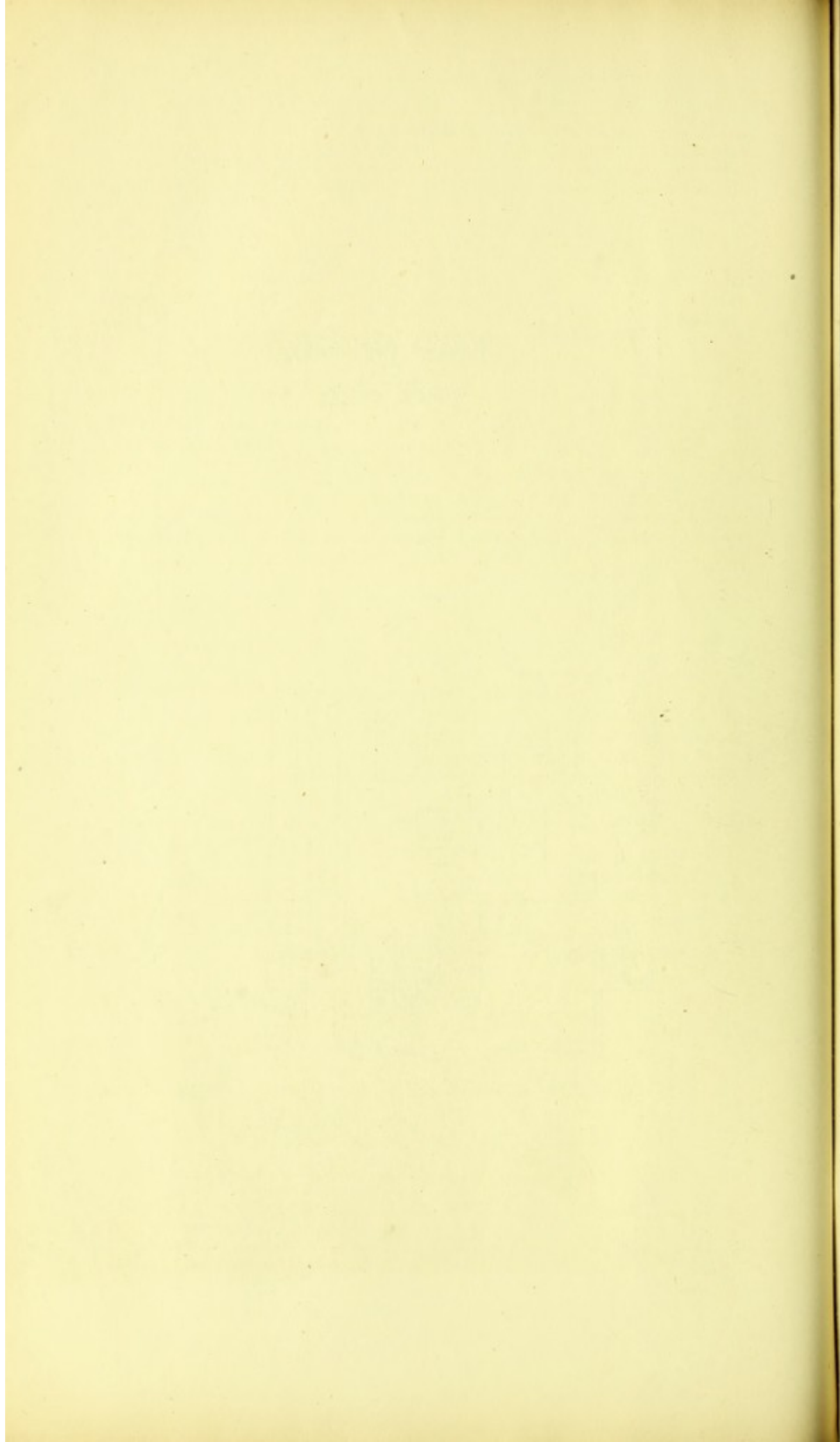
(57).—PUNIAN.

| | |
|--|------------------|
| Census population (1891) | 454 |
| Roll-call, (April 1898) | 443 |
| Jats | 222 |
| Other Hindus | 109 |
| Chamars | 74 |
| Muhammadians | 24 |
| Sweepers | 14 |
| Number of houses | 171 |
| Do. do. infected | 58 |
| Do. plague cases | 58 |
| Do. deaths | 25 |
| Do. recoveries | 33 |
| Date of first case | 14th April 1898. |
| Do. declaration of plague | 18th do. |
| Do. cordoning of village | 18th do. |
| Do. evacuation of village | 24th do. |
| Do. commencement of disinfection | 28th do. |
| Do. completion do. | 1st June 1898. |
| Do. last case | 4th May 1898. |
| Do. return to village | 16th June 1898. |
| Do. removal of cordon | 22nd do. |
| Do. village declared free of plague | 27th do. |

To face page 60.

MAP No. 20.
CHAK KALAL.





There is rather strong evidence that there were two almost simultaneous sources of infection at Punian; four persons were attacked within a day of each other in distant parts of the village between which there was no direct connection, and in both cases there was a history of infection from without, and the disease spread throughout the village from these two centres of infection.

The first person to be attacked with plague in Punian was Sang Singh, son of Lida, a lambardar. He was attacked on April 14th. He had been to Banga on April 8th or 9th, and had brought some *jala* grass from the house of Saiva, Brahmin, whose two daughters, it is said, were then suffering from plague, but concealed. Dead rats were noticed in Sang Singh's house on April 10th or 11th; this house is marked (1) on the accompanying map. On the same day that Sang Singh was attacked or the next, Gangi, wife of Har Bhagwan, was taken ill with plague. She lived in quite a different part of the village, and neither she nor any of her relatives have had anything to do with Sang Singh or his family. She had not been out of the village for some time, but her husband had a *halwai* shop in Banga and went there daily taking some of his stock there and back. Dead rats were noticed in this house, which is marked (1) on the map on April 10th or 11th.

The following notes have reference to the spread of plague through the village, the houses on the map have been numbered, one set with Arabic, the other with Roman numerals, according as to whether their infection can be traced from Sang Singh's or Gangi's house, respectively.

1. *Vide supra.*
2. Next to 1: dead rats noticed here some days before Rao was attacked on 8th April. She attended patients in 1.
3. Kahno, wife of Subha Singh, attacked April 20th; attended patients in 1.
4. Lalu is a servant of residents in 1.
5. House next to 1: dead rats noticed some days before Jawala was attacked.
6. House next to 2: dead rats noticed as above.
7. Bani had been working in 1: attacked April 24th.
8. Roda had attended patients in 5.
9. Jiwi had frequently been in house of other patients.

I.—*Vide supra.*

- II.—House next to 1: there is a hole in the wall between the two houses; dead rats were found here on April 11th or 12th.

III.—No history.

- IV.—Permeshari, daughter of Ram Singh, Brahmin, was attacked here on April 19th: dead rats were found in the house some days previously; her brother Nandu attacked on April 24th had attended patients in I.

V.—Dosaunda Singh attended patients in II: house next to I.

VI.—No history, next to III.

VII.—Permeshari, daughter of Bupa, had been living in VI.

VIII, IX.—No history.

X.—Next to I, II and V.

XI.—Next to III: dead rats found in the house before the residents left the village.

XII, XIII.—Next to III and I, respectively; Basanti, resident of XIII, was a frequent visitor in I.

XIV, XV.—No history. The former was an exceedingly dirty house.

Basant Ram, Compounder, was attacked with plague on May 4th, while on duty at Chak Kalal. He had left Punian the previous day where he had superintended the disinfecting gang. He is thought to have contracted the disease from house No. IX, into which he went to get a ruler, before it was disinfected.

The little village of Hamerowal with a population of 89 persons, chiefly Muhammadan Rajputs, is close to Punian, only a few yards separating their outlying houses. There was no plague in Hamerowal, but it was considered to be in the interest of the inhabitants that they should evacuate the village, which, in spite of considerable disinclination on their part, they did on April 24th.

The village was treated as an infected one, its houses were disinfected and whitewashed, and holes were made in the roof of every house, 28 in number: during this process of disinfection thirty dead rats were found in the village, and the people afterwards admitted that on the very day they left the village dead rats had been found in one of the houses.

Note by Surgeon Captain James —

On subsequent enquiry at Punian the information was elicited from several sources that rats had begun to die in the village eight or nine days before any one was attacked with plague. The disease, if brought from Banga as stated by Dr. Wilkinson, must have been subsequent to the infection of the rats. As a matter of fact, it is very doubtful if Saiva ever had plague in his house in Banga, as, at the time, we had a very complete list of the inhabitants and daily inspections were being made by the hospital assistants in every part of Banga. Har Bhagwan's shop was situated in a portion of the town which was not infected. It is therefore probable that the people of Punian, not knowing of the possibility of rats bringing the disease from other villages, tried to account for the curious simultaneous appearance of the disease in two parts of their village in the manner recorded by Dr. Wilkinson. They certainly were very definite about the rats being previously attacked when questioned on the subject.

(61). REHPA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 677 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 743 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 423 |
| Chamars | ... | ... | ... | ... | ... | ... | 150 |
| Ramdais | ... | ... | ... | ... | ... | ... | 100 |
| Muhmamdans... | ... | ... | ... | ... | ... | ... | 66 |
| Sweepers | ... | ... | ... | ... | ... | ... | 4 |
| Number of houses | ... | ... | ... | ... | ... | ... | 145 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 12 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 21 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 12 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 9 |
| Date of first case | ... | ... | ... | ... | ... | ... | 16th April. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 22nd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 22nd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 23rd do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 8th May. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 30th do. |
| Do. last case | ... | ... | ... | ... | ... | ... | 9th do. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 2nd June. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 8th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 12th do. |

It is only with great difficulty that any information concerning the conveyance of plague to their village has been obtained from the inhabitants of Rehpa: the first person to be attacked was Chandi, wife of Variyam Singh, who was taken ill on April 16th, and died the next day; she had buboes on both sides of the neck.

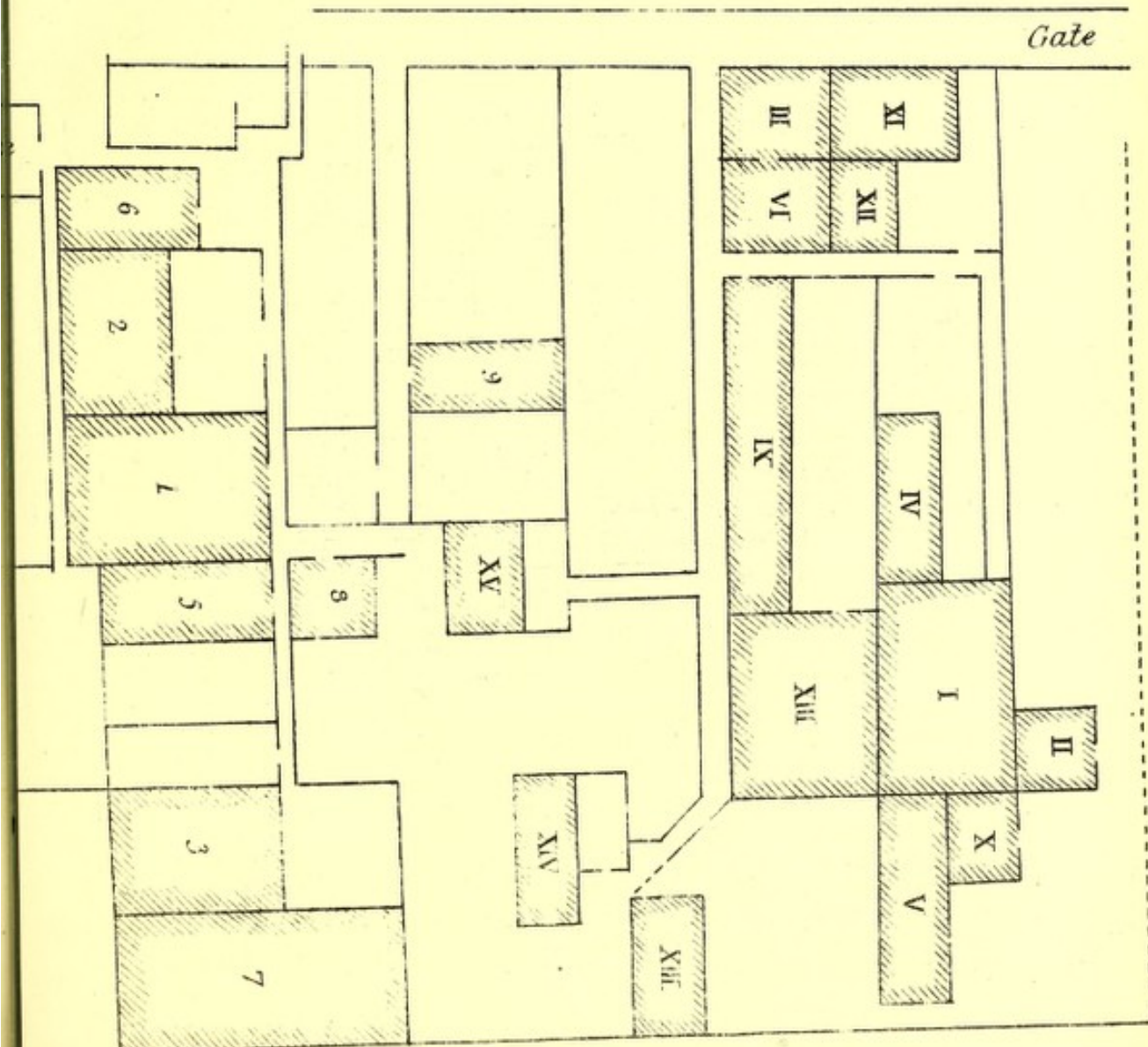
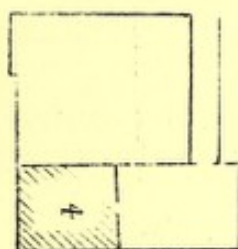
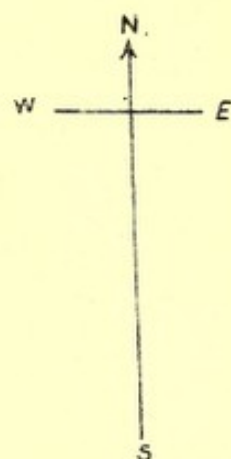
It is said that Gulab Singh, a Darzi of Jagatpur, had brought clothes to this house on April 14th. A member of his family, name not ascertained, is said to have died of plague, and it is stated that he made these clothes in the segregation camp at Jagatpur.

With reference to these statements it may be mentioned that it has been ascertained that there is a tailor named Gulab Singh at Jagatpur and that he lived in a house next to that in which Partapi, wife of Sham Singh, was attacked with plague. An inhabitant of Jagatpur stated independently that Gulab Singh had taken clothes to the house of the person first attacked at Rehpa, whose name he did not know.

To face page 62.

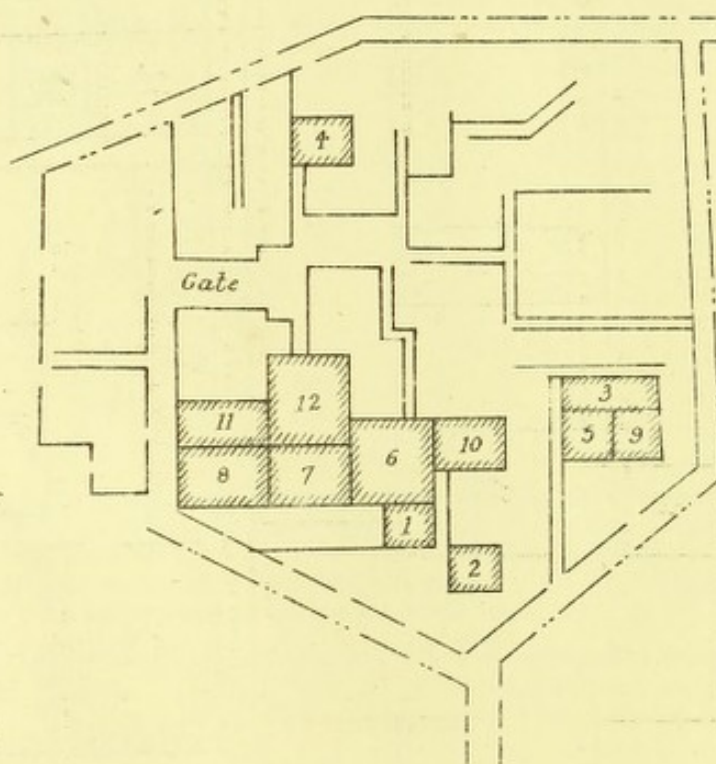
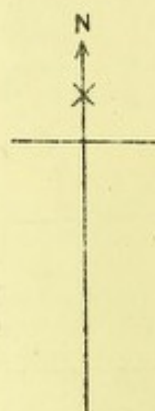
MAP No. 21.

PUNIAN.



To face page 63.

MAP No. 22.
REPHA.



The house of Chandi, wife of Variyam Singh, is marked (1) on the accompanying map, and the other houses are numbered in the order in which they became infected.

2. Close to 1, and the families are closely related: Variyam Singh being the brother of four patients in this house.
3. Rulda, Chamar, was a servant in 2.
4. Attar Singh and Variyam Singh have a common *haveli* which is next to 1 on the map. Attar Singh was also often in 1: dead rats were found in his house, one three days and the other two days before he was attacked, April 22nd.
5. Next to 3: dead rats were seen here two days before the patient Thani was attacked.
6. House near 1, and there is friendship between the families: dead rats were seen here a week before the patient Katora was attacked.
7. The back of this house adjoins 6: several dead rats were found in the house before the patient Kinmi was attacked.
8. Mian Singh was a friend of Veri, daughter of the last named patient, who was herself attacked with plague, and often visited her in 7.
9. No definite history. House next to 3 and 5.
- 11, 12. Houses adjoin previously infected ones.

(62). GOSLAN.

| | | | | | | | |
|--------------------------------------|-----|-----|-----|-----|-----|-----|------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 494 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 504 |
| Sikhs | ... | ... | ... | ... | ... | ... | 188 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 102 |
| Chamars | ... | ... | ... | ... | ... | ... | 112 |
| Sweepers | ... | ... | ... | ... | ... | ... | 35 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 30 |
| Muhammadans, chiefly Rajputs | ... | ... | ... | ... | ... | ... | 37 |
| Number of houses | ... | ... | ... | ... | ... | ... | 127 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 10 |
| Do. plague cases | ... | ... | ... | ... | ... | ... | 11 |
| Do. deaths | ... | ... | ... | ... | ... | ... | 8 |
| Do. recoveries | ... | ... | ... | ... | ... | ... | 3 |
| Date of first case | ... | ... | ... | ... | ... | ... | 21st April |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 22nd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 22nd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 25th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 7th May. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 5th June. |
| Do. last case | ... | ... | ... | ... | ... | ... | 5th May. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 10th June. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 16th do. |
| Do. villages declared free of plague | ... | ... | ... | ... | ... | ... | 20th do. |

The evidence as to how Goslan became infected with plague is very precise.

Manu, wife of Bura, Jat, went to Punian on April 20th, to see her sister-in-law Jivi, wife of Gulaba. On that day there was a roll-call of Punian by the Plague Inspection Staff, and Jivi being ill of plague Manu answered for her in the roll-call. She returned to her house at Goslan that evening, and was taken ill with plague at noon the next day, dying during the night. She was the first person attacked with plague at Goslan. Her house is marked 1 on the accompanying map.

Very little reliable information could be obtained concerning the spread of the disease through the village. The people deny ever having seen dead rats in their houses, but numbers were found during the disinfection of the village; this may be due to the fact that the village was evacuated the day after the first case occurred there.

No dead rats found before evacuation; some found during disinfection of houses.

(66). AUJLA.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 630 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 424 |
| Jats | ... | ... | ... | ... | ... | ... | 201 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 102 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 30 |
| Chamars | ... | ... | ... | ... | ... | ... | 91 |
| Number of houses | ... | ... | ... | ... | ... | ... | 109 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 4 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 5, Actual | 9 |
| Do. deaths returned | ... | ... | ... | ... | ... | 4, Do. | 8 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 1, Do. | 1 |
| Date of first case | ... | ... | ... | ... | ... | 21st April. | |
| Do. do. returned | ... | ... | ... | ... | ... | 27th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 27th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 27th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 13th May. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | |
| Do. last case | ... | ... | ... | ... | ... | 18th May. | |
| Do. return to village | ... | ... | ... | ... | ... | 7th June. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 13th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 17th do. | |

No evidence whatever can be obtained concerning the infection of Aujla. The inhabitants maintain that nobody entered or left the village for at least a month previous to the first person being attacked; they further insist that no person in their village ever suffered from plague, though eight persons, of the nine who became ill between April 21st and May 20th, died.

Very little reliable information can be obtained on account of the reticence of the people.

The first case was Agali, wife of Attru, Chamar, who was attacked on April 21st and died on April 30th. Three others of the fifteen residents of her house were attacked. It should be stated that one of these was a child a few days old, whose mother, Khemi, was attacked with plague on April 25th, and died on May 3rd.

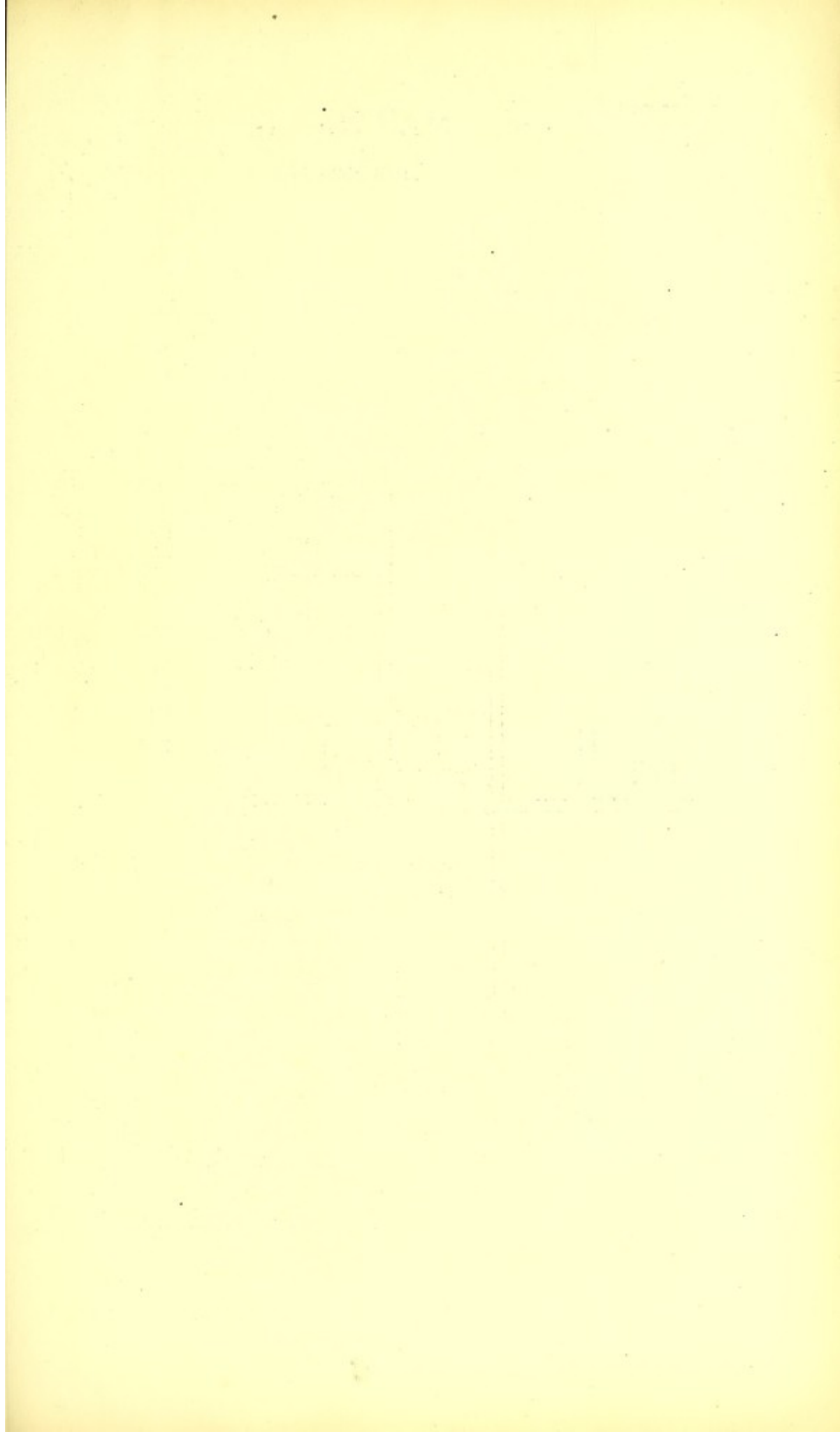
No history can be obtained as to how the other patients became attacked.

(67). CHHOKRAN.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 847 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 905 |
| Hindu Jats | ... | ... | ... | ... | ... | ... | 551 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 69 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 106 |
| Chamars | ... | ... | ... | ... | ... | ... | 142 |
| Ramdasis | ... | ... | ... | ... | ... | ... | 24 |
| Sweepers | ... | ... | ... | ... | ... | ... | 13 |
| Number of houses | ... | ... | ... | ... | ... | ... | 161 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 14 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 10, Actual | 19 |
| Do. deaths returned | ... | ... | ... | ... | ... | 4, Do. | 13 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 6, Do. | 6 |
| Date of first case | ... | ... | ... | ... | ... | 16th April. | |
| Do. do. returned | ... | ... | ... | ... | ... | 10th May. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 10th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 10th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 10th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 2nd June. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 14th do. | |
| Do. last case | ... | ... | ... | ... | ... | 25th May. | |
| Do. return to village | ... | ... | ... | ... | ... | 15th June. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 21st do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 25th do. | |

The first case of plague at Chhokran was Sunder Singh, son of Nihal Singh, who was attacked on April 6th; he died on April 21st and was burnt, no mention of his illness or death having been made to the authorities. He had gone to Salh Kalan about the end of March, and had stayed there nearly a fortnight with his sister, Gulab Dai, wife of Ganda, Jat, and on returning to Chhokran had brought back with him his sister's son, Nama, and her two daughters, Nami and Guzari, together with a widow named Malan.

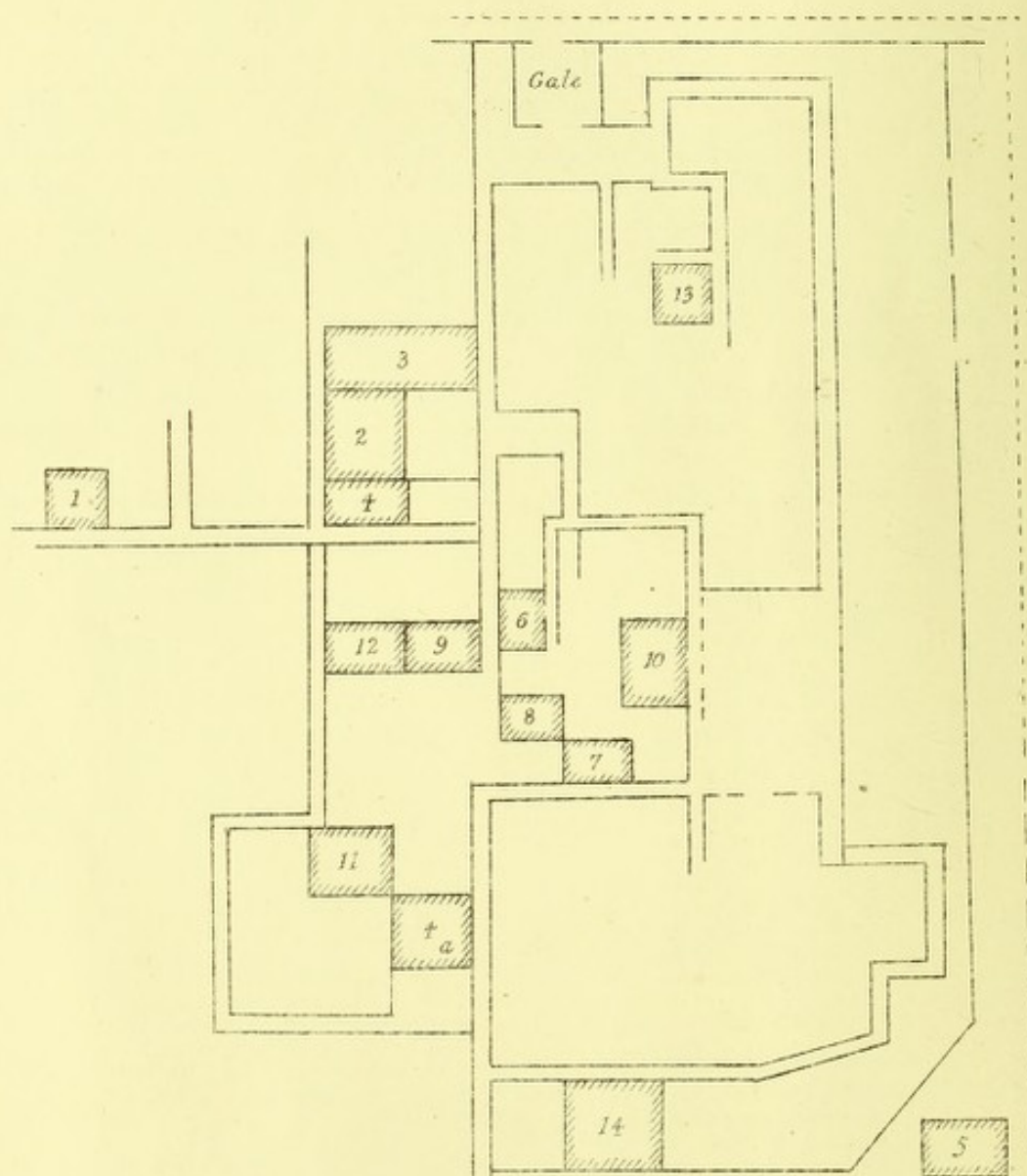
Mode of infection.



To face page 65.

MAP No. 23.

CHHOKRAN.



Gale

3

2

177

2

Q

1

7

11

7

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

100

There was plague at Salh Kalan while Sunder Singh was there, but not in Gulab Dai's house; she was afterwards attacked and died of the disease as did her daughter Nami, who returned to her home with her brother and sister on April 24th.

Sunder Singh's house is marked (1) on the accompanying map: there were two others living in the house, neither of whom was attacked with plague nor were any dead rats found here.

The spread of plague
through the village.
on the map.

The following notes refer to the spread of plague
through the village, the figures corresponding with those

2. Said was attacked on April 21st and died on April 27th: he had not left the village nor had any one in his house: four dead rats were found in his house three days after his death: his brother, Bhudda, was attacked here on April 30th.
3. Dead rats were found here on April 19th: the patient Basanti threw them away, and was attacked with plague on April 22nd, dying on April 28th.
4. This is the shop of Saindi, and is next to 3: four dead rats were found in it on April 22nd, and he was attacked on April 25th. His house is in a different part of the village and is marked 4a on the map.
5. The patient Gulabi was a beggar woman, and is said to have begged from most houses in the village, but nothing definite is known about her.
6. The families in this house and in 3 are great friends. The patient Atttri attended Mehtab Kaur in 3, and washed her clothes; she also found the dead rats in 3 and threw them away.
7. The dead rats were found in this house three days before Basant Singh was attacked, he was often in 6.
8. No definite history: house next to 7.
9. A large number of dead rats were found in this house four or five days before the patient, Hazara, was attacked.
10. Meli attended Atttri in 6, and was attacked a week after first going there.
11. House next to 4a: dead rats seen here three days before the patient was attacked.
12. House next to 9.
13. Ishar Singh is a lambardar of the village, and had visited many infected houses previous to his being attacked.
14. Dauli was a beggar and had been into many infected houses.

(72). TURAN.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----------|------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 233 |
| Roll-call, May 1898 | ... | ... | ... | ... | ... | ... | 185 |
| Hindus, chiefly Jats | ... | ... | ... | ... | ... | ... | 119 |
| Muhammadians | ... | ... | ... | ... | ... | ... | 32 |
| Others | ... | ... | ... | ... | ... | ... | 34 |
| Number of houses | ... | ... | ... | ... | ... | ... | 47 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 3 |
| Do. plague cases returned | ... | ... | ... | ... | 4, Actual | ... | 6 |
| Do. deaths returned | ... | ... | ... | ... | 2, Do. | ... | 4 |
| Do. recoveries returned | ... | ... | ... | ... | 2, Do. | ... | 2 |
| Date of first case | ... | ... | ... | ... | ... | 5th May. | |
| Do. do. returned | ... | ... | ... | ... | ... | 25th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 25th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 25th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 25th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 2nd June. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 12th do. | |
| Do. last case | ... | ... | ... | ... | ... | 27th May. | |
| Do. return to village | ... | ... | ... | ... | ... | 15th June. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 21st do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 25th do. | |

Shankar Devi, the first person attacked with plague at Turan, was a relative of Gunda, son of Choga, a resident of Chhokran; he went to see Gunda on April 25th, and found him suffering from plague.

Mode of infection.

Shankar Devi was attacked with plague on May 2nd, and his daughter, Partapi, fell ill on May 6th.

Only three infected houses
which adjoin one another.

Only two other persons were attacked with plague in Turan, and their houses adjoin that of the first case.

B.—NAWASHAHR CIRCLE.

THE NOTES CONCERNING THE FOLLOWING TWENTY-ONE VILLAGES OF THE NAWASHAHR CIRCLE HAVE BEEN SENT US BY SURGEON-CAPTAIN H. SMITH, I. M. S., WHO SUCCEEDED SURGEON-LIEUTENANT WALTON, I. M. S., IN MEDICAL CHARGE OF THIS AREA.

(5). SHIKOHPUR.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-------------------------|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 592 |
| Roll-call | ... | ... | ... | ... | ... | 517 |
| Muhammadians (Fakirs) | ... | ... | ... | ... | ... | 66 |
| Hindus, all classes | ... | ... | ... | ... | ... | 332 |
| Chamars | ... | ... | ... | ... | ... | 118 |
| Sweepers | ... | ... | ... | ... | ... | 1 |
| Number of houses | ... | ... | ... | ... | ... | 124 |
| Do. do. infected | ... | ... | ... | ... | ... | not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 75 |
| Do. deaths | do. | ... | ... | ... | ... | 41 |
| Do. recoveries | do. | ... | ... | ... | ... | 34 |
| Date of first case | ... | ... | ... | ... | early in December 1897. | |
| Do. do. returned | ... | ... | ... | ... | 1st February 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | 1st do. | |
| Do. cordoning of village | ... | ... | ... | ... | 1st do. | |
| Do. evacuation of | do. | ... | ... | ... | 2nd do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 6th do. | |
| Do. completion of | do. | ... | ... | ... | 29th March 1898. | |
| Do. last case | ... | ... | ... | ... | 5th do. | |
| Do. return to village | ... | ... | ... | ... | 9th April 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | 9th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | 19th do. | |

As already stated, plague probably existed in this village at the beginning of December or even earlier. On the 28th January, on account of some rumours which were floating about, a medical officer inspected the village. From the inquiries he made he found that 9 deaths had taken place since December 28th, only 5 of which had been entered in the registers. The village only contained about 500 inhabitants, and the fact that in the past month there had been so many deaths was in itself very suspicious, and when it was found that four cases had been concealed the suspicions were strengthened. The whole population of the village was collected in a suitable place outside the walls and examined, and a full list of the names according to families made. The village was also searched, but nothing definite discovered. However, a cordon was placed round it, and a hospital assistant sent down to make daily roll-calls and examine anybody who happened to get ill. For two days nothing happened. But on the 3rd day, February 1st, 2 Chamars did not answer to their names at the morning roll-call. They were afterwards found in their houses suffering from plague, and the fact was duly reported. When the people found that the disease had been discovered they gave up all further duplicity and brought forward their sick for treatment. By the evening 13 cases of plague were shown. In one case a sick man was brought out of a cattle-shed where he had been kept locked up for several days. Afterwards, when the disinfection was being carried out, dead bodies were found hidden away within the village walls, and one man admitted that there had been many more deaths in the village before our arrival, of which we had no knowledge. There seems to have been a very systematic attempt in this village to conceal the existence of the disease, and the attempt was for a time most successful. But the casualties in consequence were very heavy. Not counting the many cases which occurred before our arrival, and of which we have very little definite knowledge, 75 persons were attacked and 41 died making a percentage of 19 attacked and 8.2 killed by the disease.

The people were all got out into camp by the evening of February 2nd, which was quick work, as the huts for them had to be brought from Banga, 10 miles away by road. They were placed in four camps, *viz.*, Segregation Camp, Hospital Camp, Healthy Jats' Camp, and Healthy Chamars' Camp, on the south side of the village. The hospital was situated south-east of the village. Even after the people came out, dropping cases occurred among them; in consequence of which Dr. Walton had all the clothes and property in all the camps disinfected. The result was immediate. The disease stopped, and with the exception of one dropping case of a man on the disinfecting staff, who was attacked on March 3rd, no new cases occurred. The people returned to their house on April 9th, having spent two months and seven days in camp.

Plague was discovered in the village of Shikohpur on the 2nd February when the hospital registers show, that 13 cases were taken out at once. With regard to the origin of the disease in Shikohpur it was never possible to

establish such relations with the people of the village as to render it possible to arrive at the truth, and this is not to be wondered at as the village lambar-dars underwent a criminal prosecution. Such prosecutions establish a peculiar reticence in the people, not only of the particular village, but in those of other villages, in giving us information as regards the true facts concerning the importation of the disease, lest it might bring an official judgment on some one for what they regard as a very small offence, if any offence at all. Such is the reticence of a people, Hindu, Sikh and Musalman, who apart from plague daily pray for the release of all prisoners. The only thing we could find was that fully 30 deaths occurred before the village was evacuated. We can say with a reasonable amount of certainty that the disease existed in Shikohpur, from the end of December or the beginning of January at which time the nearest plague village was 7 or 8 miles off, so the question of human agency in connection with the infection does not admit of doubt. Rats would not be at all likely to pass all the other villages on the way and pitch on Shikohpur.

(10). SAHLON.

| | | | | | |
|--|-----|-----|-----|-----|----------------------|
| Census population (1891) .. | ... | ... | ... | ... | 983 |
| Roll-call .. | ... | ... | ... | ... | 979 |
| Muhammadians .. | ... | ... | ... | ... | 29 |
| Hindus, all classes (chiefly Jats) .. | ... | ... | ... | ... | 848 |
| Chamars .. | ... | ... | ... | ... | 102 |
| Number of houses .. | ... | ... | ... | ... | 157 |
| Do. do. infected .. | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned .. | ... | ... | ... | ... | 107 |
| Do. deaths returned .. | ... | ... | ... | ... | 74 |
| Do. recoveries .. | ... | ... | ... | ... | 33 |
| Date of first case .. | ... | ... | ... | ... | During January 1898. |
| Do. do. returned .. | ... | ... | ... | ... | 23rd February 1898. |
| Do. declaration of plague .. | ... | ... | ... | ... | 23rd do. |
| Do. cordoning of village .. | ... | ... | ... | ... | 23rd do. |
| Do. evacuation of do. .. | ... | ... | ... | ... | 4th March 1898. |
| Do. commencement of disinfection .. | ... | ... | ... | ... | 8th do. |
| Do. completion of do. .. | ... | ... | ... | ... | 26th April 1898. |
| Do. last case .. | ... | ... | ... | ... | 31st March 1898. |
| Do. return to village .. | ... | ... | ... | ... | 29th April 1898. |
| Do. removal of cordon .. | ... | ... | ... | ... | 9th May 1898. |
| Do. village declared free of plague .. | ... | ... | ... | ... | 9th do. |

Sahlon is some 200 yards from Shikohpur and is on the main line of traffic. Besides, the Sahlon people cultivate land as tenants in Shikohpur and there is frequent intercourse between them.

Sahlon was discovered on the 22nd February at which time it was found to be infected throughout. It is impossible under the same circumstances as referred to in Shikohpur to say when the first case occurred. We are of opinion from its intensity and from what information we can obtain that it existed about a month prior to its discovery. From the facts above stated there is no room for doubt but that it was infected from Shikohpur, and that the agency was human, when we compare rough facts and dates. There is no necessity for a "rat" theory here.

(12). KAMAM.

| | | | | | |
|--|-----|-----|-----|-----|---------------------|
| Census population (1891) .. | ... | ... | ... | ... | 1,969 |
| Roll-call .. | ... | ... | ... | ... | 2,075 |
| Muhammadians (Arains) .. | ... | ... | ... | ... | 855 |
| Hindus, all classes (Rajputs) .. | ... | ... | ... | ... | 949 |
| Chamars .. | ... | ... | ... | ... | 181 |
| Sweepers .. | ... | ... | ... | ... | 86 |
| Sahsis .. | ... | ... | ... | ... | 4 |
| Number of houses .. | ... | ... | ... | ... | 596 |
| Do. do. infected .. | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned .. | ... | ... | ... | ... | 61 |
| Do. deaths returned .. | ... | ... | ... | ... | 45 |
| Do. recoveries returned .. | ... | ... | ... | ... | 16 |
| Date of first case .. | ... | ... | ... | ... | 20th February 1898. |
| Do. do. returned .. | ... | ... | ... | ... | 26th do. |
| Do. declaration of plague .. | ... | ... | ... | ... | 26th do. |
| Do. cordoning of village .. | ... | ... | ... | ... | 26th do. |
| Do. evacuation of do. .. | ... | ... | ... | ... | 6th March 1898. |
| Do. commencement of disinfection .. | ... | ... | ... | ... | 19th do. |
| Do. completion of do. .. | ... | ... | ... | ... | 30th April 1898. |
| Do. last case .. | ... | ... | ... | ... | 31st March 1898. |
| Do. return to village .. | ... | ... | ... | ... | 4th May 1898. |
| Do. removal of cordon .. | ... | ... | ... | ... | 14th do. |
| Do. village declared free of plague .. | ... | ... | ... | ... | 14th do. |

The first case of plague in this village was a Chamar, named Ramu, who died on February 22nd. It is not known how he contracted the disease. When the village was inspected by the Medical Officer on February 26th, 4 cases of plague were found in two houses; one a blacksmith's house and the other a Brahmin's. Of these, the blacksmith's seem to have been first affected, Nihala, son of Narain Singh, had been ill five days, and Wazir Singh's wife the same time. Nihali, wife of Bashambar, was attacked two days later, but was already dead when the inspecting officer arrived. Her body was examined and found to present signs of plague. Amin, a Brahmin, was not the first person attacked, but his case is interesting. He was willingly shown up to Dr. Davidson by the lambardars on February 27th. He was a shop-keeper whose home was in Kamam, but he carried on business with his brother Jeora in Karnana. He is said by the lambardars of Kamam to have spent some two or three weeks in Shikohpur and later on in the adjoining village of Sahlon, dealing in sugar-cane juice. Sahlon is a central place for the neighbouring villages to get their sugar-cane juice expressed: January and February being the season for such work. On leaving Sahlon apparently about the 17th February, possibly on business, and possibly on discovering that plague existed there (which was not officially known till 22nd February) Amin went off to Kamam, stayed there a day or two, and then went on to his shop in Karnana. He stayed in Karnana a few days with his brother Jeora, and then went back to Kamam saying he felt ill. This seems to have been on the 24th February. On the 27th, the lambardars showed Amin to Dr. Davidson, who decided that he was suffering from plague. The following facts are interesting concerning Amin's family:—On the 2nd March Dr. Davidson found in Karnana that Amin's brother and partner—Jeora—was ill with plague. He was sent to Kamam hospital and his house disinfected with phenyle and locked up, Karnana being kept under observation and no fresh cases having occurred, was declared free after some weeks. Plague was re-discovered on the 6th April.

(15). KATHARON.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|----------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 1,020 |
| Roll-call | ... | ... | ... | ... | ... | ... | 983 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 182 |
| Hindus (Jats) | ... | ... | ... | ... | ... | ... | 615 |
| Chamars | ... | ... | ... | ... | ... | ... | 173 |
| Sweepers | ... | ... | ... | ... | ... | ... | 13 |
| Number of houses | ... | ... | ... | ... | ... | ... | 229 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 38 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 22 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 16 |
| Date of first case | ... | ... | ... | ... | ... | ... | During January 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | ... | 1st March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 1st do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 1st do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | ... | 10th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 31st do. |
| Do. completion of do. | ... | ... | ... | ... | ... | ... | 12th May 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 16th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 18th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 28th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 28th do. |

In this village as in Kamam the lambardars behaved very decently throughout. The first case owned to by them is that of Bora, son of Wazira, a teli, who recovered about the 24th or 25th February.

The chaukidar's book, however, shows that Mussammat Asu, wife of Wazira, teli, died on the 2nd February. This, 2nd of February is, I take it, approximate, as chaukidar's registers are not filled up daily, but in spurts, so that dates are a good deal of guess work. It is very likely from the facts that this woman died of plague and not from another disease as the chaukidar's register shows, and I think, I am justified in assuming such from the following facts:—

One Uttam Singh, son of Sahib Singh, of Shikohpur, went to Jullundur before Shikohpur was cordoned on business, i.e., before the 2nd February. He came back on February the 2nd, to find it cordoned, and not being able to get into Shikohpur went to stay at Katharon, and slept in the house of

this very Wazira. Next day he went again to Shikohpur and got permission to go in, and as is borne out by the hospital register, got ill by the 4th February and went into hospital, after having been away at Jullundur for some days and on his return through Wazira's house into the approximately infected camp of Shikohpur. I think it is fairly conclusive from the dates and facts that he got the infection in Wazira's house on the 2nd February, and that Wazira's wife, Asu, died of plague.

As to how Wazira's house became infected, I think it is substantially conclusive. It is customary here for telis to clean cotton for the zamindars, and Wazira was the most famous cleaner about here, and did a large business with Shikohpur. Throughout January plague was raging in Shikohpur officially unknown, and all that time the Shikohpur Jat women were taking cotton to be cleaned to Wazira's house in Katharon. From these facts, I think it is fairly conclusive that Asu, Wazira's wife, got plague from the Shikohpur customers.

The second case was that of Wazira's son, and the next two occurred in the houses of two Rajputs adjoining that of Wazira's, and from this it is spread over the village.

Plague was officially recognized in Katharon on the 2nd March.

NOTE.—When the Medical Officer went to Shikohpur on January 28th he heard that plague existed in both Katharon and Sahlon; but could not get any details which would enable him to find the cases. The disease was therefore probably in both these villages at an earlier date than stated above. (C. H. J.).

(16). KARNANA.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|---------------------|-------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,328 |
| Roll-call | ... | ... | ... | ... | ... | 1,436 |
| Muhammadans | ... | ... | ... | ... | ... | 292 |
| Hindus, all classes | ... | ... | ... | ... | ... | 857 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | 264 |
| Sweepers | ... | ... | ... | ... | ... | 23 |
| Number of houses | ... | ... | ... | ... | ... | 282 |
| Do. do. infected | ... | ... | ... | ... | ... | 1 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 1 |
| Do. deaths returned | ... | ... | ... | ... | ... | 1 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 0 |
| Date of first case | ... | ... | ... | ... | 28th February 1898. | |
| Do. do. returned | ... | ... | ... | ... | 2nd March 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | 2nd do. | |
| Do. cordoning of village | ... | ... | ... | ... | 2nd do. | |
| Do. evacuation of do. | ... | ... | ... | ... | Not evacuated. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 19th March 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 20th do. | |
| Do. last case | ... | ... | ... | ... | 2nd do. | |
| Do. return to village | ... | ... | ... | ... | 29th do. | |
| Do. removal of cordon | ... | ... | ... | ... | 29th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | 29th do. | |
| Further infection (No. 45). | | | | | | |
| Date of declaration of plague | ... | ... | ... | ... | 6th April 1898. | |
| Do. cordoning of village | ... | ... | ... | ... | 6th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | 7th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 12th May 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 10th June 1898. | |
| Do. last case | ... | ... | ... | ... | 3rd May 1898. | |
| Do. return to village | ... | ... | ... | ... | 11th June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | 22nd do. | |
| Do. village declared free | ... | ... | ... | ... | 22nd do. | |

The first case in Karnana was discovered on the 2nd March and details of it are given above in connection with Kamam. I think there is absolutely no doubt that this was the first case. After the infected house had been disinfected and the village kept under observation for a few weeks, it was declared free. On the 6th April, it was found to be again infected. We could not get out any information in connection with this so-called re-infection until the villagers got into a more happy mood after their return to their houses. They were, while in camp, most obstructive in a passive way, and most reluctant in giving information of any kind. After their return to their houses it transpired that shortly after the man Jeora was removed and his house had been disinfected and locked-up, a girl in the next house got ill: she recovered. Next followed Mussammat Utmi, wife of Suba, Mahlon and Mussammat Premi, wife of Ralla, Lahore. These people's

houses were adjoining one another, as well as that of Jeora. The next to fall ill were their neighbours Mussammats Gujri and Ishri, and Sada Singh, and then Nihal, the Brahmin. Until the return of the village, the Karnana people concealed all the above cases.

When the Brahmin got ill, the people of the village romanced a good deal as to where he might have got infected, but we could put no credence in this, as he was recognised on the 6th; and between the 6th and 9th, 16 cases were taken out, so that it was certain there must have been other cases before him. It is plain that the first case was steadily followed by the others which were concealed. If we had accepted—as we were very near having to do—the romancing about the infection of the Brahmin, there would have been very fine scope for a “rat theory.”

NOTE.—Dr. Smith does not show how the infection spread from Jeora's house to those surrounding it, after he had left the locality and the house had been locked up. May not this have been due to rats? (C. H. J.)

(20). LODHIPUR.

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | 1,165 |
| Roll-call | ... | ... | ... | ... | 1,233 |
| Muhammadans (Arains) | ... | ... | ... | ... | 806 |
| Hindus, all classes | ... | ... | ... | ... | 274 |
| Chamars | ... | ... | ... | ... | 150 |
| Sweepers | ... | ... | ... | ... | 3 |
| Number of houses | ... | ... | ... | ... | 275 |
| Do. do. infected | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | 49 |
| Do. deaths returned | ... | ... | ... | ... | 33 |
| Do. recoveries returned | ... | ... | ... | ... | 16 |
| Date of first case | ... | ... | ... | ... | 14th February 1898. |
| Do. do. returned | ... | ... | ... | ... | 7th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | 7th do. |
| Do. cordoning of village | ... | ... | ... | ... | 7th do. |
| Do. evacuation of do | ... | ... | ... | ... | 10th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | 31st do. |
| Do. completion of do. | ... | ... | ... | ... | 9th May 1898. |
| Do. last case | ... | ... | ... | ... | 13th April 1898. |
| Do. return to village | ... | ... | ... | ... | 14th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | 24th do. |
| Do. village declared free of plague | ... | ... | ... | ... | 24th do. |

The lambardars of this village behaved excellently, and ultimately assisted us in tracing the origin of the disease. Plague was reported on the 6th March, when 3 cases and 1 death were found to have occurred. The lambardars recently stated that about the beginning of February, Achhru, son of Taba, went to Karnal in the Hoshiarpore District, to visit his maternal grandmother, Mussammatt Resan. On his way back from Karnal he stopped in the village of Simul Mazara, at the house of one Saon, Chamar, the brother-in-law of the father-in-law of Achhru's uncle—Hira—and in whose house—Saon's—plague is said to have existed at the time. Plague, I understand, existed in Simul Mazara for a considerable time before it was officially recognised. Achhru after staying for the night in Simul Mazara returned to Lodhipur, and about two days after his return, I believe, plague was discovered in Simul Mazara, and it was cordoned. We are given to understand from the Lodhipur people that Achhru got ill about the middle of February. The cordoning of Simul Mazara was about that date. The disease spread amongst the Chamars from this centre and from a couple of infected Chamar children is said to have infected the first Jat—the child of Fazia, who had been playing about with them just before they got ill. From this latter centre the disease also spread. There is here a fairly conclusive evidence of human agency.

(22). MAHRAMPUR.

| | | | | | |
|---------------------------|-----|-----|-----|-----|-------------|
| Census population (1891) | ... | ... | ... | ... | 831 |
| Roll-call | ... | ... | ... | ... | 814 |
| Muhammadans | ... | ... | ... | ... | 64 |
| Hindus, all classes | ... | ... | ... | ... | 594 |
| Chamars and Ramdasis | ... | ... | ... | ... | 156 |
| Number of houses | ... | ... | ... | ... | 155 |
| Do. do. infected | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | 56 |
| Do. deaths returned | ... | ... | ... | ... | 33 |
| Do. recoveries returned | ... | ... | ... | ... | 23 |

| | |
|--|------------------|
| Date of first case | 7th March 1898. |
| Do. do. returned | 9th do. |
| Do. declaration of plague | 9th do. |
| Do. cordoning of village | 9th do. |
| Do. evacuation of do. | 14th do. |
| Do. commencement of disinfection | 19th April 1898. |
| Do. completion of do. | 19th May 1898. |
| Do. last case | 30th April 1898. |
| Do. return to village | 21st May 1898. |
| Do. removal of cordon | 31st do. |
| Do. village declared free of plague | 31st do. |

The first man to get ill was Ram Singh, son of Dial Singh, a tarkhan. It is generally admitted that he was in the habit of going into Sahlon, the neighbouring village, in which plague was rife at that time. He is said to have brought clothes out of Sablon belonging to a Sadhu, named Kahn Das. In Mahrampur two Sahdus, named Kahn Das and Kishen Das, have a home in common. When plague broke out in Shikohpur and in Sahlon later on, the latter village determined on a solemn reading of the Granth to avert the evil. Kahn Das was asked to act as reader and he went to Sahlon and after performing the religious rites stayed a while longer in the village. Kahn Das amongst other things received, as is customary, for performing *paths*, many presents of clothes from the relatives of the deceased in whose memory the *path* is performed. The Ram Singh above mentioned, a pupil of Kishen Das, is said to have broken the Sahlon cordon in order to see a relative named Hira Singh who lived in Sahlon. Kishen Das, brother of Kahn Das, was at this time occupying an out-house of Ram Singh for the purpose of performing a *path* for a neighbour of Ram Singh. Ram Singh is said to have at this time gone to Sablon—breaking the cordon—mixed with the people and brought back the cloth which Kahn Singh had got for performing the ceremonies in Sahlon to the home of the Sadhus whose pupil he was. Sahlon at that time was having six or seven attacks of plague daily. From Ram Singh's house the disease spread over the village in a wandering fashion. It was turned into camp early before the disease had time to fasten on any quarter in a wholesale fashion. I think this is again fairly conclusive evidence of human agency.

(32). MAHMUDPUR.

| | |
|--|------------------|
| Census population (1891) | 411 |
| Roll-call | 394 |
| Muhammadans (Jats) | 321 |
| Hindus all classes | 2 |
| Chamars | 71 |
| Number of houses | 80 |
| Do. do. infected | Not stated. |
| Do. plague cases returned | 24 |
| Do. deaths returned | 16 |
| Do. recoveries returned | 8 |
| Date of first case | 4th March 1898. |
| Do. do. returned | 22nd do. |
| Do. declaration of plague | 22nd do. |
| Do. cordoning of village | 22nd do. |
| Do. evacuation of do. | 24th do. |
| Do. commencement of disinfection | 21st April 1898. |
| Do. completion of do. | 29th May 1898. |
| Do. last case | 13th April 1898. |
| Do. return to village | 30th May 1898. |
| Do. removal of cordon | 9th June 1898. |
| Do. village declared free of plague | 9th do. |

The lambardars did their utmost to conceal the disease and were successful in doing so for some time. Instructions were issued for a criminal prosecution for them, which was subsequently abandoned. It has, as a consequence, been extremely difficult to get any trace of the infection of this village. They were opposed to our interference from beginning to end and the idea of the criminal prosecution having been abandoned was still doubtful to them, however much we endeavoured to persuade them. Being utterly powerless to get any information from them direct or through our native staff, we got the lambardar of a friendly village to try and elicit the information for us in

an unsuspecting way. He found out that one Ganga Ram, who died, was the first case and that he had contracted the disease from Sahlon, where he had been to see his friend Bela Singh on hearing that his family was ill. That Ram Singh was the first case is fairly evident from the following facts :—

On the 16th March funeral meats were seen at the door of Ganga Ram's house by the British Officers then making a search for plague cases. These meats normally I understand remain out for from four to seven days, though they may remain out as long as thirteen days. I think it is fairly evident that Ganga Ram died between the 11th and 16th.* The friendly lambardar found out that a case was hidden amongst the crops when the British Officers made another search. This case was Mussammat Rajji, a member of Ganga Ram's household, and that about the 20th Ganga Ram's wife died of plague in Mazara Nauabad. On the 22nd nearly all the cases were in houses adjoining that of Ganga Ram. The above facts elicited by the friendly lambardar independently, when compared with the hospital register of Sahlon in which plague had been raging for over a month at the time, is fairly conclusive. Neither the friendly lambardar nor the Mahmudpur people were at all likely to have any thing approaching correct dates of cases in Sahlon.

The Sahlon hospital register shows that the wife and daughter of the Bela Singh with whom Ganga Ram was said to have gone to condole in Sahlon when his family became ill—Mussammat Gujri and Puru—died on the 9th March and that Bela Singh's brother died on the 5th March and that Bela Singh himself died on the 6th March. As above stated, Ganga Ram must have died himself between the 11th and 16th. We can find no room for the concoction of this story from spite. It is, I think, conclusive evidence of human agency.

*NOTE.—From information received from Mazara Nauabad, to which village Ganga Ram's wife fled, we found that he died on March 4th (vide page 54). (C. H. J.).

(34). MUSAPUR.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,721 |
| Roll-call | ... | ... | ... | ... | ... | 1,715 |
| Muhammadians | ... | ... | ... | ... | ... | 522 |
| Hindus all classes (Jats) | ... | ... | ... | ... | ... | 852 |
| Charnars and Ramdasis | ... | ... | ... | ... | ... | 322 |
| Sweepers | ... | ... | ... | ... | ... | 19 |
| Number of houses | ... | ... | ... | ... | ... | 359 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 32 |
| Do. deaths returned | ... | ... | ... | ... | ... | 23 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 9 |
| Date of first case | ... | ... | ... | ... | 18th March 1898. | |
| Do. do. returned | ... | ... | ... | ... | 25th do. | |
| Do. declaration of plague | ... | ... | ... | ... | 25th do. | |
| Do. cordoning of village | ... | ... | ... | ... | 25th do. | |
| Do. evacuation of village | ... | ... | ... | ... | 25th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 19th April 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 27th May 1898. | |
| Do. last case | ... | ... | ... | ... | 9th do. | |
| Do. return to village | ... | ... | ... | ... | 28th do. | |
| Do. removal of cordon | ... | ... | ... | ... | 8th June 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | 8th do. | |

Plague was first discovered in Musapur on the 21st March officially. By the 23rd, 5 deaths had occurred. The first case was that of Rora, son of Massa, Chamar, who must have got ill on or about the 18th March. We find that Rora had business transactions and friendly relations with Jhandoo, son of Manga, a wealthy trading Chamar of Lodipur. The Musapur people make no secret of it that Rora used to go to Lodipur to see this man, and the Lodipur people, who are a most reticent lot, say that they met "on the boundary." Jhandoo got ill in Lodipur on the 8th of March and his wife and son got ill on the 12th March. I think that there is no doubt that the infection of Musapur was thus acquired.

(35). SODHIAN.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 291 |
| Roll-call | ... | ... | ... | ... | ... | 328 |
| Muhammadians | ... | ... | ... | ... | ... | 27 |
| Hindus, all classes | ... | ... | ... | ... | ... | 212 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | 89 |
| Number of houses | ... | ... | ... | ... | ... | 55 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 21 |
| Do. deaths returned | ... | ... | ... | ... | ... | 13 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 8 |
| Date of first case | ... | ... | ... | ... | 26th March 1898. | |
| Do. do. returned | ... | ... | ... | ... | 29th do. | |
| Do. declaration of plague | ... | ... | ... | ... | 29th do. | |
| Do. cordoning of village | ... | ... | ... | ... | 29th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | 29th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 20th April 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 31st May 1898. | |
| Do. last case | ... | ... | ... | ... | 24th April 1898. | |
| Do. return to village | ... | ... | ... | ... | 1st June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | 11th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | 11th do. | |

Plague was discovered in Sodhian on the 28th of March officially. There is little doubt that Jodh Singh, son of Kishen Singh, was the first case. A few days before he got ill, he had carried in his cart the luggage of a police guard from Kamam to Mehl Gahla, an infected village. The police guard was from Ludhiana, and Jodh Singh had himself served for some time in the Ludhiana police. His cart had been used on more than one occasion to carry police luggage. Having been a policeman himself, it is said that the police allowed him to go into the village of Mehl Gahla to see some friends and get *bhusa* for his bullocks. From Mehl Gahla he went to Banga for his pay and from there he was sent to Shikohpur for it. This took about three days, after which he returned to his home and got ill next day, the 26th March. The Sodhian people, when they saw he had plague, reported the fact. In this case the proof of actual personal contact with plague infected people is wanting, though from the facts stated and from the results, I think, the presumption that such was the case is a very rational one.

(44). CHAHLAN.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 583 |
| Roll-call | ... | ... | ... | ... | ... | 549 |
| Muhammadians | ... | ... | ... | ... | ... | 34 |
| Hindus, all classes | ... | ... | ... | ... | ... | 421 |
| Chamars | ... | ... | ... | ... | ... | 94 |
| Number of houses | ... | ... | ... | ... | ... | 115 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 29 |
| Do. deaths returned | ... | ... | ... | ... | ... | 18 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 11 |
| Date of first case | ... | ... | ... | ... | 31st March 1898. | |
| Do. do. returned | ... | ... | ... | ... | 6th April 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | 6th do. | |
| Do. cordoning of village | ... | ... | ... | ... | 6th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | 6th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 5th May 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 1st June 1898. | |
| Do. last case | ... | ... | ... | ... | 1st May 1898. | |
| Do. return to village | ... | ... | ... | ... | 2nd June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | 12th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | 12th do. | |

Plague was officially discovered in Chahlan on 6th April. But by that time it had got a firm hold on the village, as on the 6th, 6 cases more were discovered. The first person to fall ill was, according to the villagers, a Gujri woman, Churi by name. About the same time they say her son Nabia got ill, and after him two other Gujri women, Gajon and Jindoon, who lived in the next neighbouring house. The next to fall ill was a Chamari named Mussammat Sultani, whose house was adjoining that of Gajon and Jindoon. Mussammat Atri, a Jati, next-door neighbour to Nabia, above-mentioned. Chahlan is about 400 yards from Kamam and the Chahlan and Kamam people cultivate within one another's village boundary. We find that Umbia was really the first case and his mother Churi, the second, both dying about the 1st or 2nd

of April. Nabia used to graze goats on land on the Chahlan-Kamam boundary. Towards the end of March, before the disease was extinct in Kamam, the Kamam people celebrated a *niaz* and Nabia, a fellow-Mussulman, slipped over the boundary to share in the feast. He brought back some of the food for the members of his household who did not venture across the cordon line. I think it is rational to infer that Nabia thus introduced the disease from Kamam. The people of Chahlan behaved well.

(47). AUR.

| | |
|--|------------------|
| Census population (1891) | 2,850 |
| Roll-call | 2,602 |
| Muhammadans, chiefly Arains and Rawals | 1,368 |
| Hindus, all classes, chiefly Brahmins and Khatris | 1,017 |
| Chamars and Ramdasis | 188 |
| Sweepers | 89 |
| Number of houses | 594 |
| Do. do. infected | 1 |
| Do. plague cases returned | 1 |
| Do. deaths returned | 0 |
| Do. recoveries returned | 1 |
| Date of first case | 5th April 1898. |
| Do. do. returned | 7th do. |
| Do. declaration of plague | 7th do. |
| Do. cordoning of village | 7th do. |
| Do. evacuation do. | Not evacuated. |
| Do. commencement of disinfection | 15th April 1898. |
| Do. completion of do. | 16th do. |
| Do. last case | 7th do. |
| Do. return to village | |
| Do. removal of cordon | 19th do. |
| Do. village declared free of plague | 19th do. |

Re-appearance of disease (No. 75).

| | |
|--------------------------------------|----------------------|
| Date of declaration of plague | 23rd July 1898. |
| Number of cases | 4 |
| Deaths | 0 |
| Recoveries | 4 |
| Infected houses | 3 |
| Date of cordoning of village | 23rd July 1898. |
| Evacuation of village | 11th August 1898. |
| Commencement of disinfection | 11th do. |
| Completion of do. | 8th September 1898. |
| Last case | 24th July 1898. |
| Return to village | 10th September 1898. |
| Village declared free | 20th do. |

There was one case in Aur on the 6th of April. It was shown up at once. The inmate occupied one of two houses which constituted an isolated block. Both houses were evacuated, disinfected, unroofed, lime-washed and allowed to remain empty for the usual time. No further case occurred in Aur. Aur was some miles from any infected village with many villages between. Under such circumstances few things are more certain than that the infection was brought there by human agency. Dr. Wilkinson found four more cases of plague on July 23rd, after which the whole village was evacuated and disinfected.

(48).MALPUR.

| | |
|--|------------------|
| Census population (1891) | 709 |
| Roll-call | 584 |
| Muhammadans | 47 |
| Hindus, all classes, chiefly Jats | 389 |
| Chamars and Ramdasis | 142 |
| Sweepers | 6 |
| Number of houses | 117 |
| Do. do. infected | 4 |
| Do. plague cases returned | 9 |
| Do. deaths returned | 7 |
| Do. recoveries returned | 2 |
| Date of first case | Unknown. |
| Do. do. returned | 9th April 1898. |
| Do. declaration of plague | 9th do. |
| Do. cordoning of village | 9th do. |
| Do. evacuation of village | 9th do. |
| Do. commencement of disinfection | 29th do. |
| Do. completion of do. | 22nd May 1898. |
| Do. last case | 17th April 1898. |
| Do. return to village | 23rd May 1898. |
| Do. removal of cordon | 2nd June 1898. |
| Do. village declared free of plague | 2nd do. |

Malpur is about 200 yards from Mahrampur. Plague in Malpur was discovered early, there being but 9 cases in all. They went into camp on the 9th April. All we can find out about this village concerning the first case is that the patient's husband was a frequent visitor to Mahrampur across the cordon, and that plague cases were occurring at the time in Mahrampur camp. The only instance in this circle in which there is any evidence of rats wandering outside the walls of the village is the following:—The Chamar Camp was outside the village close to the walls of their own quarter. The well which they were using was under the wall of their own quarter and outside the village. They requested that another well might be given to them as they had observed a number of rats running about the well and that they ultimately plunged into the well and were drowned. This is no evidence of migration. Rats drink water as other animals do, while in health. These rats were presumably in the feverish stage of the disease previous to the outset of delirium, and like all animals in this stage of any fever, they were intensely thirsty and went to the well they were accustomed to go to for water. Rats usually go out to drink at night, but the stress of the feverish thirst may have impelled them to go in the day time in this instance. That they jumped into the well I think admits of doubt; but if they did, it can only be inferred that they were determined to allay their thirst at any cost. This incident is no evidence of migration.

(50). HANSARON.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 694 |
| Roll-call | ... | ... | ... | ... | ... | 657 |
| Muhammadans | ... | ... | ... | ... | ... | ... |
| Hindus, all classes, chiefly Jats | ... | ... | ... | ... | ... | 484 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | 162 |
| Sweepers | ... | ... | ... | ... | ... | 11 |
| Number of houses | ... | ... | ... | ... | ... | 155 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 40 |
| Do. deaths returned | ... | ... | ... | ... | ... | 23 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 17 |
| Date of first case | ... | ... | ... | ... | ... | 14th March 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 13th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 13th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 13th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 13th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 24th do. |
| Do. last case | ... | ... | ... | ... | ... | 21st April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 25th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 4th June 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 4th do. |

We find that the first case in Hansaron was one Gonda who was taken out on the 14th March and who recovered. After a strong attempt to conceal matters the old *nai* of Hansaron let out that this was the real first case. The Hansaron people then freely admitted that he had been into Katharon which was cordoned, watching his crops which were situated within the Katharon boundary and that he used to associate there with one Bube Khan, a Rajput, whose land adjoined his, and that when Bube Khan became ill of plague he went to see him. Bube Khan was admitted into the Katharon hospital on the 7th April. Everything considered, I think the evidence is fairly presumptive of human agency.

(60). RASULPUR.

| | | | | | | |
|---------------------------|-----|-----|-----|-----|-----|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 636 |
| Roll-call | ... | ... | ... | ... | ... | 716 |
| Muhammadans, chiefly Jats | ... | ... | ... | ... | ... | 508 |
| Hindus | ... | ... | ... | ... | ... | 36 |
| Chamars | ... | ... | ... | ... | ... | 158 |
| Sweepers | ... | ... | ... | ... | ... | 4 |
| Sabnsis | ... | ... | ... | ... | ... | 10 |
| Number of houses | ... | ... | ... | ... | ... | 146 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 42 |
| Do. deaths returned | ... | ... | ... | ... | ... | 25 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 17 |

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Date of first case | ... | ... | ... | ... | ... | 10th April 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 22nd do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 22nd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 22nd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 29th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 17th May 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 8th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 18th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 18th do. |

Plague was discovered in Rasulpur on 21st April. The first man to get ill was Indar, son of Buta, on the 10th April. About the time that Chahlan was cordoned, viz., 6th April—Munshi and Sunder, sons of Kaka of Chahlan, went to Rasulpur and put up for the night with Indar above mentioned. At that time a member of the same household as Munshi and Sunder was ill. His name was Achru. The whole of Indar's household contracted the disease and from them it spread over the village in an erratic fashion, affecting but one Chamar—a woman who was acting as hakim in treating the cases. This erratic fashion is to be explained by the fact that the village corn-grinding mill was in the compound or court-yard into which Indar's house opened, and that by the custom of the village Chamars are debarred by caste rules from using the village mill, whereas it is a general meeting place for the Jats. The evidence of introduction into the village is fairly conclusive of human agency and the evidence is conclusive that, as compared with rats, human agency is the means of spread of the disease within the village.

The villagers say that there were about 40 cases of plague there between December and the time when the outbreak was recognised, with only 3 deaths, and that such fine results were due to the treatment of a Chamari hakim who had seen plague in some of the other villages. She herself got ill and died of the disease in Rasulpur. She claimed that she could only succeed in cases if she got them the moment fever set in. There are a few people in Rasulpur whom she scarified. Assuming that she scarified every fever case over the usual bubonic regions it is not to be wondered at that her recoveries were so numerous, as until early in April, I am convinced, that there was no plague in the village and that she had earned her reputation because she scarified every case of ordinary fever she came across. After careful investigation, I state this opinion, as unless the facts are known, a wrong impression may be formed which may be made much of elsewhere.

(59). PIRAGPUR.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 484 |
| Roll-call | ... | ... | ... | ... | ... | 413 |
| Muhammadians, chiefly Rajputs | ... | ... | ... | ... | ... | 376 |
| Hindus, all classes | ... | ... | ... | ... | ... | 3 |
| Chamars | ... | ... | ... | ... | ... | 34 |
| Number of houses | ... | ... | ... | ... | ... | 104 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 83 |
| Do. deaths returned | ... | ... | ... | ... | ... | 61 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 22 |
| Date of first case | ... | ... | ... | ... | ... | Unknown. |
| Do. do. returned | ... | ... | ... | ... | ... | 21st April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 21st do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 21st do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 1st May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 18th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 12th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 11th May 1893. |
| Do. return to village | ... | ... | ... | ... | ... | 14th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 25th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 25th do. |

Plague was officially discovered in Piragpur on the 21st April. The people of this village behaved very badly. There were over 40 deaths before the inhabitants were turned out. They have been all along and still are in dread of criminal prosecutions for designedly concealing the disease and for refusing to go out into camp. So that all our efforts up to the present to get information as to the introduction of the disease into

this village has been fruitless. It may be obtained some day, if any one takes the trouble to investigate it. But, considering that we have so much exact information about other villages, it seems hardly necessary.

(58). KARIHA.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1848 |
| Roll-call | ... | ... | ... | ... | ... | 1846 |
| Muhammadans, chiefly Rajputs | ... | ... | ... | ... | ... | 1407 |
| Hindus, all classes | ... | ... | ... | ... | ... | 141 |
| Chamars | ... | ... | ... | ... | ... | 226 |
| Sweepers | ... | ... | ... | ... | ... | 72 |
| Number of houses | ... | ... | ... | ... | ... | 428 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated |
| Do. plague cases returned | ... | ... | ... | ... | ... | 195 |
| Do. deaths returned | ... | ... | ... | ... | ... | 142 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 53 |
| Date of first case | ... | ... | ... | ... | ... | 5th April 1898. |
| Do. do. returned | ... | ... | ... | ... | ... | 20th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 20th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 20th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 28th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 16th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 4th do. |
| Do. return to village | ... | ... | ... | ... | ... | 19th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 12th July 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 12th do. |

Plague was discovered in Kariha on the 19th April. The people of this village refused to go into camp until the 30th April, and were not all completely out until the 3rd May. The approximate number of deaths before the village turned out were 126. Of the 69 cases admitted into hospital only 12 died. This is due to the fact that within the first few days after going into camp upwards of 60 of these cases were weeded out, and most of them had already passed the crisis. I have very grave doubts that the 126 deaths recorded before the village turned out into camp include the total death-rate within the village. That the cases, upward of 60 weeded out of camp within few a days after the village turned out, represent practically all the survivors of the outbreak in the village prior to the date when they turned out, is as near an approach to certainty as any fact of this kind can be. I am confident a patient does not get well of plague in a day. When careful inspection of the camp was carried out, it was an approach to the impossible for patients in the early stage of recovery from such a disease to escape observation, and as we have ascertained that the first case was on the 5th April the cases which recovered must have been only in the early stage of recovery when the village turned out into camp. It is extremely unlikely that the disease, which had claimed so many victims in so short a time, should have naturally exhausted itself by the time the village was turned out into camp. But after evacuation the epidemic quickly subsided, and this quick termination, I think, must be attributed to the beneficial effects of the evacuation. In this village there are five factions with a lambardar each. Three of these factions are actively hostile to the other two and do not associate with them. The disease broke out amongst the latter two factions, who occupied about one-third of the village. Amongst the former three factions there were but 15 houses attacked when the village went into camp. If the disease had exhausted itself at this time, how was it that two factions were decimated and the other three factions living side by side with them practically escaped? To say that the disease had exhausted itself thus is absurd. With regard to the rat theory, if rats to any practical extent at all carry the disease from place to place in so far as infection of human beings is concerned, why was the disease in Kariha confined to the quarters of practically only two of the five factions? Why did they draw a hard and fast line at the houses of the enemies of those factions whose roofs they occupied? If we assume that they really have a prescience and calculate results beforehand, and leave a village from dread of the disease, as some would have us believe, we cannot understand them being thus loyal to the owners of the roofs which they occupied. The case of Kariha is to me conclusive evidence that rats within a village get ill and remain about their original abode and die

there without wandering away from it, except from a mere desire to quench their thirst in the early stage before delirium sets in. In the stage of delirium, they may appear in places in which they otherwise would not, but in this stage they are physically unable to wander far.

The first case was one Mussammat Jiwan. She got ill on the 5th April, and lives herself to tell the tale. Her brother-in-law, Karim Bakhsh—Rain—states that on the 1st April, or, in his own words, “four days before Mussammat Jiwan became ill,” he went to Kamam on business, but was stopped by the Kamam cordon, and that on his return through Chahlan he called at the house of Nabia—the only Mussalman in Chahlan, and afterwards returned to his own house in which Mussammat Jiwan was living. We know that plague existed in Nabia’s house at that date. There is doubt as to whether Karim Bakhsh got ill himself. On inspection there was no evidence of his having been ill. When Mussammat Jiwan got a bad bubo her neighbours—women—came to touch the wound with the “hem of their garment” so as to distribute the pain over several persons, and this diffuse it so that the particular individual attacked might then be alleviated. It is a custom amongst women and low castes to meet and touch the sufferer from painful inflammatory affections in the belief that they will thus diffuse and alleviate the pain. This touching of the inflammatory swelling probably caused the disease to be spread all over the Rain’s quarters. On investigation we find that the first eight cases are traced to the above cause—all Rains. The ninth case was a Chamar—a servant of the fourth case, and from that Chamar it spread all over the Chamar’s quarter.

(63). BHANGAL.

| | | |
|---|-----|------------------|
| Census population (1891) ... | ... | 1,014 |
| Roll-call ... | ... | 965 |
| Muhammadans ... | ... | 106 |
| Hindús, all classes, chiefly Jats ... | ... | 719 |
| Chamars ... | ... | 138 |
| Sweepers ... | ... | 2 |
| Number of houses ... | ... | 237 |
| Do. do. infected ... | ... | Not stated. |
| Do. plague cases returned ... | ... | 45 |
| Do. deaths returned ... | ... | 32 |
| Do. recoveries returned ... | ... | 13 |
| Date of first case ... | ... | 10th April 1898. |
| Do. do. returned ... | ... | 24th do. |
| Do. declaration of plague ... | ... | 24th do. |
| Do. cordoning of village ... | ... | 24th do. |
| Do. evacuation of do. ... | ... | 27th do. |
| Do. commencement of disinfection ... | ... | 16th May 1898. |
| Do. completion of do. ... | ... | 11th June 1898. |
| Do. last case ... | ... | 8th May 1898. |
| Do. return to village ... | ... | 12th June 1898. |
| Do. removal of cordon ... | ... | 22nd do. |
| Do. village declared free of plague ... | ... | 22nd do. |

Plague was reported in Bhangal on the 23rd of April by the zaildar of Kariha. The village went into camp on the 26th April. Prior to the 28th April eight deaths were admitted. On the 28th nine cases were weeded out, and on 30th nine more. Making a total of 29 cases up to the 30th April. The exact date of the first case we cannot accurately fix. But if we presume that plague existed in Bhangal from about the 10th April or earlier, we would not be far wrong. The first case is, according to his own statement, the Lambardar Harbhaj—who survived. This is borne out by other evidence. It is also proved satisfactorily that the Bhangal people while Katharon was cordoned did business transactions for them in Nawashahr. Harbhaj states that he had been several times to Katharon prior to his attack. This statement is corroborated by another patient who recovered. We also find that a Bhangal woman, the wife of Khazana, used to go regularly to Katharon to see her married daughter. About that time the infective principle of plague was abundant in Katharon. The second case was the wife of Harbhaj’s neighbour, Dittu, who used to visit Harbhaj’s wife to condole with her. The third case was Dittu’s daughter. The next house it visited was Dittu’s brother’s house, and from these *foci* it spread. It is generally stated by the Bhangal people

that Harbhaj went to Katharon—cordoned—camp to visit the Lambardar, Narain Singh. Narain Singh's sister's son, Wariama, was attacked on the 16th April, and we may presume that as their huts were close, the relatives congregated around the same *hookah*. I think it is fairly evident that Harbhaj brought the disease from Katharon. Proof of actual contact in such cases is always concealed, but from the facts it is most probable.

(64). BAJON.

| | |
|--|------------------|
| Census population (1891) | 230 |
| Roll-call | 234 |
| Muhammadans, chiefly Jats | 197 |
| Hindús, all classes | nil |
| Chamars | 37 |
| Number of houses | 43 |
| Do. do. infected | Not stated. |
| Do. plague cases returned | 16 |
| Do. deaths returned | 10 |
| Do. recoveries returned | 6 |
| Date of first case | 20th April 1898. |
| Do. do. returned | 26th do. |
| Do. declaration of plague | 26th do. |
| Do. cordoning of village | 26th do. |
| Do. evacuation of do. | 29th do. |
| Do. commencement of disinfection | 17th May 1898. |
| Do. completion of do. | 5th June 1898. |
| Do. last case | 7th May 1898. |
| Do. return to village | 6th June 1898. |
| Do. removal of cordon | 16th do. |
| Do. village declared free of plague | 16th do. |

The first case in Bajon was Amin, son of Khazana, a sweetmeat-seller, who was attacked on the 20th and died on 25th April. His body was seen. The villages of Piragpur, Bajon and Laroya are but a few hundred yards from one another and depend on one another for supplies. The sweetmeat-seller of these three villages lived in Bajon. He had been daily in Piragpur on business up till it was cordoned on the 19th April. But there must have been plenty of plague in this village since April 10th. The source infection in this case is therefore fairly evident.

(68). LAROYA.

| | |
|--|------------------|
| Census population (1891) | 462 |
| Roll-call | 520 |
| Muhammadans, chiefly Arains | 246 |
| Hindús, all classes, chiefly Jats | 201 |
| Chamars | 73 |
| Number of houses | 98 |
| Do. do. infected | Not stated. |
| Do. plague cases returned | 13 |
| Do. deaths returned | 10 |
| Do. recoveries returned | 3 |
| Date of first case | 21st April 1898. |
| Do. do. returned | 18th May 1898. |
| Do. declaration of plague | 18th do. |
| Do. cordoning of village | 18th do. |
| Do. evacuation of do. | 18th do. |
| Do. commencement of disinfection | 5th June 1898. |
| Do. completion of do. | 19th do. |
| Do. last case | 3rd do. |
| Do. return to village | 23rd do. |
| Do. removal of cordon | 30th July 1898. |
| Do. village declared free of plague | 30th do. |

There is no shop in Laroya except the sweetmeat-seller's. Laroya depends for its shop and its sweepers on Piragpur, a few hundred yards distant. Plague, as above noted, was raging in Piragpur about and prior to the time it was cordoned on 19th April. The first case in Laroya was Gonda, the son of Sahib Singh, who was attacked about the 21st April. This man had been in Piragpur a short time before to get drugs for cattle and had been purchasing seed from Sonda, son of Pir Bakhsh, in Piragpur. We now know that Sonda's daughter-in-law died of plague in Piragpur on the 19th and that Sonda himself died on 21st, and his son Munhsi on the 24th. His son Kira died on the 19th, it is said. It is thus practically certain that Gonda got the infection in Piragpur.

The hospital assistant on observation duty in the neighbourhood of Laroya at that time, is said to have pronounced Gonda's wife—whom I afterwards saw in hospital—to be suffering from ordinary fever, as well as another case. The first cases were all amongst the relatives of Gonda.

(73). JHINGRAN.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------|-------------|
| Census population (1891) | ... | ... | ... | ... | ... | 1,103 |
| Roll-call | ... | ... | ... | ... | ... | 1,226 |
| Muhammadians | ... | ... | ... | ... | ... | 60 |
| Hindus, all classes, chiefly Jats | ... | ... | ... | ... | ... | 793 |
| Chamars | ... | ... | ... | ... | ... | 340 |
| Sweepers | ... | ... | ... | ... | ... | 33 |
| Number of houses | ... | ... | ... | ... | ... | 225 |
| Do. do. infected | ... | ... | ... | ... | ... | Not stated. |
| Do. plague cases returned | ... | ... | ... | ... | ... | 13 |
| Do. deaths returned | ... | ... | ... | ... | ... | 7 |
| Do. recoveries returned | ... | ... | ... | ... | ... | 6 |
| Date of first case | ... | ... | ... | ... | 28th April 1898. | |
| Do. do. returned | ... | ... | ... | ... | 26th May 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | 26th do. | |
| Do. cordoning of village | ... | ... | ... | ... | 26th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | 26th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | 5th June 1898. | |
| Do. completion of do. | ... | ... | ... | ... | 21st do. | |
| Do. last case | ... | ... | ... | ... | 3rd do. | |
| Do. return to village | ... | ... | ... | ... | 30th do. | |
| Do. removal of cordon | ... | ... | ... | ... | 10th July 1898. | |
| Do. village declared free of plague | ... | ... | ... | ... | 10th do. | |

Plague was reported on 24th May in Jhingran. In all there were 13 cases amongst three neighbouring families. The first was Mussammat Ishrim, daughter of Nathu, Jat. She had been visiting her uncles Nathu and Gaya at Aujla in the Banga Circle and when plague broke out, about the 28th April in Aujla, her mother went there from Jhingran and brought her home. Eight other persons were attacked in the same family.

ARAPA.

Plague was reported in this village on the 12th of May.—I went there on the 13th, but did not see the case as the body had been burned. The hospital assistant and tahsildar's account were, if true, convincing that it was plague. But a certain amount of doubt attaches to their story as regards its truth. A number of neighbouring houses were cleared out into a Segregation Camp, and the village roll called. The roll-call was satisfactory. The above-named houses were isolated, disinfected, unroofed and lime-washed. After a reasonable time in segregation,—the roll-calls in the mean time having been satisfactory,—the people were allowed to return to their houses and the village cordon removed. No more cases occurred. This village does not appear in the returns owing to the doubt which hinges about the veracity of the reported case. Arapa is a long distance from any infected village and admits only of being infected by human agency.

D.—HOSHIARPUR DISTRICT.

WE ARE INDEBTED TO SURGEON-CAPTAIN RONALDSON CLARK, I. M. S., FOR THE NOTES OF THE SIXTEEN VILLAGES IN THE HOSHIARPUR DISTRICT. HE HAS OBTAINED MUCH USEFUL INFORMATION FROM THE DIARIES OF DOCTOR DATTA AND SURGEON-CAPTAIN HEARD, I. M. S. THE TABLES IN CONNECTION WITH EACH VILLAGE HAVE BEEN COMPILED FROM INFORMATION COLLECTED BY SURGEON-CAPTAIN G. Y. C. HUNTER, I. M. S.

[The figures preceded by H. refer to villages in the Hoshiarpur District].

H.--1. BIRAMPUR.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|-------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 1,505 |
| Roll-call, December 1897 | ... | ... | ... | ... | ... | ... | 1,493 |
| Muhammadans (Rajputs) chiefly | ... | ... | ... | ... | ... | ... | 1,086 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 183 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 147 |
| Sweepers | ... | ... | ... | ... | ... | ... | 77 |
| Number of houses | ... | ... | ... | ... | ... | ... | 347 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 40 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 49 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 34 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 15 |
| Date of first case | ... | ... | ... | ... | ... | 5th November 1897. | |
| Do. do. recorded | ... | ... | ... | ... | ... | 11th December 1897. | |
| Do. declaration of plague... | ... | ... | ... | ... | ... | 11th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 11th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 26th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 16th February 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 12th March 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 6th February 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 15th March 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 26th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 26th do. | |

In Birampur, the village in which plague began, it broke out amongst the Chamars and sweepers, and the origin has been traced to one Ganeshi, daughter of Kudoo, sweeper, who had been away from the village for some time, living with her mother's people in Khatkar Kalan in the Jullundur District. On the outbreak of plague there, she came home and arrived at Birampur on or about the 5th of November. Almost immediately after her arrival she was taken ill, and soon afterwards died of a disease, which was thought, at the time, to be pneumonia. This was really the first case of plague in Birampur. The next person to be affected was Jiwi, the mother of Ganeshi, and thereafter the disease rapidly spread, at first amongst sweepers and Chamars, and thereafter in the Rajput community.

The disease was reported on the 11th December, but by this time it had taken a firm hold on the village. Two new cases were reported on the 12th, 2 on the 14th, 6 on the 16th, 2 on the 17th, 3 on the 18th, 2 on the 19th and 3 on the 20th. Afterwards dropping cases occurred until the 6th of February 1898. The disease was all along characterised by the virulency of its type. Pneumonic cases were frequent and very fatal, and the percentage of deaths to cases was 69 during the whole outbreak. Measures were at once taken to check the spread of the disease. On the 11th December the sweepers and Chamars were removed into camp. Affected houses also were evacuated, but it was not until a fortnight later that the whole Rajput community went into camp, and even then we did not understand the necessity for very strict cordoning of the village site, for we allowed the people to keep their cattle in their cattle-houses in the village, and visit them as often as they liked. No doubt there was at this time much coming and going to the houses in the village, and this want of recognition of the danger of allowing people back to an infected village site, was the cause of the persistency with which the disease clung to Birampur. The cordon too of Birampur seems to have been somewhat lax, for we hear stories of men walking through it from and to the village.

H.--(2). PURKHOWAL.

| | | | | | | | |
|---------------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 712 |
| Roll-call, February 1898 | ... | ... | ... | ... | ... | ... | 776 |
| Muhammadans (chiefly Jats and Gajars) | ... | ... | ... | ... | ... | ... | 624 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 49 |
| Chamars | ... | ... | ... | ... | ... | ... | 103 |
| Number of houses | ... | ... | ... | ... | ... | ... | 166 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 14 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 23 |
| Do. deaths returned | ... | ... | ... | ... | ... | ... | 12 |
| Do. recoveries returned | ... | ... | ... | ... | ... | ... | 11 |

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|--------------------|
| Date of first case | ... | ... | ... | ... | ... | 27th January 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 3rd February 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 3rd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 3rd do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 3rd do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 15th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 2nd April 1898. |
| Do. last case | ... | ... | ... | ... | ... | 10th March 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 2nd April 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 18th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 18th do. |

It was this laxity of the cordon which probably caused Purkhowal to get infected. I have been told that during the infection of Birampur, the Qazi Abdullah, a resident of the village, but who was much revered in the neighbouring villages, also used, with the connivance of the constables, to go to and from other villages to read prayers, and see to the bathing of the dead in them also. Another story is that Purkhowal, a Gujar village, used to be the great depôt from which the constables on duty at Birampur bought their supplies of *ghi* and *Ata*, and that this was the origin of the outbreak at Purkhowal. The village is one adjoining Birampur at a distance of about one mile. There are many relationships between Purkhowal and Birampur, and no lack of evidence as to the frequency of coming and going between them, even after a cordon was placed. It was not till the 1st of February that the disease was actually discovered in the latter village, as a persistent attempt was made at concealment of cases. By that time it had gained a firm hold, and our attention was only directed to it by a weekly report sent to the Police Station at Garhshankar, in which were recorded 5 deaths in eight days. A report was about the same time received from a Hakim of Sasauli, stating that plague was raging in Purkhowal, and that the people of the place were busy planning to send away any member of their families that they could to their relations in other villages. Our attention being thus directed to Purkhowal, and plague having been found there on its inspection by Dr. Datta, the village was immediately cordoned and evacuated on the 3rd of February, the date on which plague was declared.

H.—(3).—RAMPUR BILRON.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|--------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 2,505 |
| Roll-call | ... | ... | ... | ... | ... | 2,850 |
| Muhammadans | ... | ... | ... | ... | ... | 355 |
| Jats | ... | ... | ... | ... | ... | 196 |
| Other Hindus (chiefly Rajputs) | ... | ... | ... | ... | ... | 1,920 |
| Chamars | ... | ... | ... | ... | ... | 244 |
| Sweepers | ... | ... | ... | ... | ... | 135 |
| Number of houses | ... | ... | ... | ... | ... | 553 |
| Do. do. infected | ... | ... | ... | ... | ... | 34 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 43 |
| Do. deaths do. | ... | ... | ... | ... | ... | 16 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 27 |
| Date of first case | ... | ... | ... | ... | ... | 31st January 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 6th February 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 6th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 6th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 6th May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 16th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 23rd June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 17th do. |
| Do. return to village | ... | ... | ... | ... | ... | 12th July 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 18th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 18th do. |

The next village to be infected was Bilron, and in it, at any rate, there is a very clear history of infection through human intercourse. I quote from Dr. Datta's report No. 8, dated 7th February 1898:—

"Mussammat Bakhtawari, the leech-woman of Bilron, used to go and apply leeches to the buboes of the Gujars of Purkhowal before we knew anything of the existence of this disease there. According to her own statement the last patient she applied leeches on was Chhajji, *lohar*, namely, on the 31st January last. I came to know of this on the 1st and 2nd instants when examining the village of Purkhowal. At first the villagers would not tell me the whereabouts of the leech-woman; but at last one of the patients told it out. On the 3rd, I went out to Bilron myself, and found the leech-woman's son suffering from plague. This son she used to take with her to Purkhowal, as he was a smart lad, and used to give her great assistance with the work. On the 5th instant I examined in this village the corpse of a young infant daughter of

Mandaria, *lohar*, and found it had died of bubonic plague, and had evidently taken the infection from Purkhowal from the family of Amolak, the *lohar*, in which there have been four deaths since the 30th ultimo. Amolak and Mandaria are near relations, and it is quite certain that the latter's wife with her child had gone to condole with the former on the 30th ultimo when the first death took place in that family."

So much for the first infection in Bilron. It seems evident that it was dependent on human intercourse and on that alone.

H.—(4).—SIMUL MAZARA.

| | |
|--|--------------------|
| Census population (1891) | 1,003 |
| Roll-call, March 1898 | 1,019 |
| Muhammadas (chiefly Fakirs) | 55 |
| Jats | 549 |
| Other Hindus | 215 |
| Chamars | 184 |
| Sweepers | 16 |
| Number of houses | 194 |
| Do. do. infected | 31 |
| Do. plague cases returned | 51 |
| Do. deaths do. | 34 |
| Do. recoveries do. | 17 |
| Date of first case | 28th January 1898. |
| Do. do. recorded | 9th February 1898. |
| Do. declaration of plague | 9th do. |
| Do. cordoning of village | 9th do. |
| Do. evacuation of do. | 5th March 1898. |
| Do. commencement of disinfection | 14th do. |
| Do. completion of do. | 18th April 1898. |
| Do. last case | 1st do. |
| Do. return to village | 19th do. |
| Do. removal of cordon | 2nd May 1898. |
| Do. village declared free of plague | 2nd do. |

Simul Mazara was the next village attacked, and in it a history of infection due to human intercourse is no less clear. The history of the infection of this village is related to that at Bachhwan, and I cannot do better than relate it in Dr. Datta's words—*vide* Report No. 9, dated 10th February 1898:—

"Whilst making an enquiry into how the infection had got into this village (Simul Mazara) we were informed that two members of the infected party, which had brought the poison here, had gone into a village called Bachhwan, and that one of these two had died there shortly after arrival, namely, on the 27th January last *. The information that I had gathered at Simul Mazara was quite correct, namely, that Albela, Fakir, and his son, Maula, had gone to Shikohpur, an infected village in the Jullundur District, to condole with Mussammat Ralli, whose father and mother (Baz and Dauli) had died of plague. This was on the 25th of January last. They stopped there that night, and the next day they travelled back along with Mussammat Risi and her husband, Shadi Fakir, to Simul Mazara, Risi being Albela's daughter. They stayed there also for a night, and on the 27th Albela and his son, Maula, started back for their own house at Bachhwan. On the road Maula became ill, had headache, diarrhoea and vomiting, and died that night at Bachhwan. The first cases in Simul Mazara were:—

- (1). Mussammat Risi, wife of Shadi, Fakir, and Albela's daughter.
- (2). Shadi, her husband.
- (3). Kalu, father of Shadi."

H.—(5).—DERON.

| | |
|--|---------------------|
| Census population (1891) | 147 |
| Roll-call, February 1898 | 165 |
| Muhammadas (chiefly Jats) | 69 |
| Jats | 34 |
| Other Hindus | 6 |
| Chamars | 56 |
| Number of houses | 39 |
| Do. do. infected | 4 |
| Do. plague cases returned | 4 |
| Do. deaths do. | ... |
| Do. recoveries do. | 4 |
| Date of first case | 27th January 1898. |
| Do. do. recorded | 19th February 1898. |
| Do. declaration of plague | 19th do. |
| Do. cordoning of village | 19th do. |
| Do. evacuation of do. | 20th do. |
| Do. commencement of disinfection | 14th March 1898. |
| Do. completion of do. | 19th do. |
| Do. last case | 18th February 1898. |
| Do. return to village | 19th March 1898. |
| Do. removal of cordon | 30th do. |
| Do. village declared free of plague | 30th do. |

Deron, the next village infected, is one about which there is some doubt. Several sources of infection are, however, possible.

(1). A Fakir, Bade Shah, had some relations in a village close to Khan Khanan. He used to go begging in Khan Khanan with his daughter. They returned to Deron about the 25th January, and on the 27th the girl died of fever accompanied with cough.

(2). On the 29th January Gulabi, a Chamar woman, died there also of fever and cough. Her parents were residents of Birampur, in which the disease was raging among the Chamars. Gulabi's brother-in-law, who lived in the same house, died on the 14th February of fever also, and in this house, on the 16th, were found the two undoubted Chamar cases of plague.

H.—(6).—BHAIJAL.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|--------------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 530 |
| Roll-call, February 1898 | ... | ... | ... | ... | ... | ... | 484 |
| Muhammadians (chiefly Fakirs) | ... | ... | ... | ... | ... | ... | 57 |
| Jats | ... | ... | ... | ... | ... | ... | 289 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 68 |
| Chamars | ... | ... | ... | ... | ... | ... | 70 |
| Number of houses | ... | ... | ... | ... | ... | ... | 107 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 27 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 52 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 37 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 15 |
| Date of first case... | ... | ... | ... | ... | ... | 6th February 1898. | |
| Do. do. recorded | ... | ... | ... | ... | ... | 21st do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 21st do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 21st do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 24th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 14th March 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 7th April 1898. | |
| Do. last case... | ... | ... | ... | ... | ... | 30th March 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 14th April 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 19th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 19th do. | |

The next village on the infected list is Bhajjal. A *kasai* family belonging to that village had become infected as early as the 6th of February while living in a *Beri* garden situated in the basima of Lahra. These people used to go into Purkhowal, before we knew of the infection existing there, to purchase their *ata* and other supplies. On the 7th February this family was found to have become infected, was stopped by a Police Constable when trying to escape back to their home in Bhajjal, and were examined by Dr. Datta, who found three members of the family suffering from plague. The family was segregated at Purkhowal; but a *Mehon*, who lived with them, had previously escaped.

This *Mehon*, it appears, had gone into Bhajjal on the 4th or 5th instant, while very ill, but still well enough to take a basket of fruit for sale. His appearance, however, excited the attention of the villagers who, suspecting him to be ill of plague, drove him from the village, scattering his basket of fruit as he went. The village *lambardars* now state that the first cases of plague, which occurred in Bhajjal, were amongst the people who assisted in driving the *Mehon* out, and in the children who ate the fruit that was scattered on the way. Be this as it may, it is, I think, sufficiently clear that the starting point of the infection in Bhajjal was from this *kasai* family living in the *Beri* garden at Lahra.

H.—(7).—SADHOWAL.

| | | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|-----|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 332 |
| Roll-call, March 1898 | ... | ... | ... | ... | ... | ... | 338 |
| Muhammadians (chiefly Jats) | ... | ... | ... | ... | ... | ... | 251 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 2 |
| Chamars | ... | ... | ... | ... | ... | ... | 85 |
| Number of houses | ... | ... | ... | ... | ... | ... | 62 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 14 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 22 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 16 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 6 |

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Date of first case | ... | ... | ... | ... | ... | Unknown. |
| Do. do. returned | ... | ... | ... | ... | ... | 6th March 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 6th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 6th do. |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 6th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 7th April 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 15th do. |
| Do. last case | ... | ... | ... | ... | ... | 27th March 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 17th April 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 19th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 19th do. |

With reference to Sadhowal, the next village on the infected list, no very clear history of human intercourse is obtainable. The villagers themselves attribute it to the fact that some Policemen came from Birampur and Purkhowal on the occasion of the *Id* to say prayers in the mosque at Sadhowal. The Qazi of the village attributes it to the visit of a *kasai* from Tejpur, but, on the other hand, no cases are known by us to have occurred in the Tejpur section of Purkhowal. Of this village, therefore, we have no very good evidence of human intercourse having spread the infection.

H.—(8). HAJIPUR.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 864 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | 784 |
| Muhammadans | ... | ... | ... | ... | ... | 55 |
| Jats | ... | ... | ... | ... | ... | 9 |
| Other Hindus (chiefly Gujars) | ... | ... | ... | ... | ... | 663 |
| Chamars | ... | ... | ... | ... | ... | 57 |
| Number of houses | ... | ... | ... | ... | ... | 214 |
| Do. do. infected | ... | ... | ... | ... | ... | 69 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 90 |
| Do. deaths do. | ... | ... | ... | ... | ... | 62 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 28 |
| Date of first case | ... | ... | ... | ... | ... | 6th March 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 9th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 9th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 9th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 2nd April 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 20th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 2nd May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 27th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 28th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 8th May 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 8th do. |

On the 9th of March the next village, Hajipur, was found to be infected. Infection was confined wholly to the Chamar families of that village, and it appears that as late as the 5th instant, when infection was well spread in Sadhowal, and the first Chamar death had occurred, some of the Chamars of Hajipur had gone over to Sadhowal on a visit of condolence after the first Chamar death in the former village.

H.—(9). PAROWAL.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 296 |
| Roll-call, March 1898 | ... | ... | ... | ... | ... | 260 |
| Jats | ... | ... | ... | ... | ... | 133 |
| Other Hindus | ... | ... | ... | ... | ... | 31 |
| Chamars | ... | ... | ... | ... | ... | 96 |
| Number of houses | ... | ... | ... | ... | ... | 54 |
| Do. do. infected | ... | ... | ... | ... | ... | 9 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 30 |
| Do. deaths do. | ... | ... | ... | ... | ... | 20 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 10 |
| Date of first case | ... | ... | ... | ... | ... | 18th March 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 24th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 24th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 24th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 24th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 20th April 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 2nd May 1898. |
| Do. last case | ... | ... | ... | ... | ... | 29th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | 25th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 7th do. |

An interval of 15 days now elapsed before the next village, namely, Parowal, was discovered. Plague was declared there on the 24th of March 1898. This village had been inspected on the 18th March, without any cases being found; but one death occurred on the 23rd and one on the 24th, and ten cases were discovered on the latter day when the village was again inspected. Several circumstances point to the conclusion that this village also was affected by human agency.

- (1). The villagers themselves attribute the introduction of the plague to one Maiya, a Jat of Parowal, whose daughter was married in Bhajjal. They say that after the disease broke out in Bhajjal, Maiya had several interviews with his son-in-law, Rama, of Bhajjal.
- (2). At the time plague was declared in Parowal, the worst infected house in the village was that of Maiya and his brother, Dari, (2 deaths and 2 cases had occurred in 2 days).
- (3). Confirmatory evidence of Maiya's having had interviews with his son-in-law after the infection of Bhajjal, was received at the time of the disinfection of the personal effects of the people of Parowal.

At this time all the people in the house of Maiya had died, and the lambardár of the village took into his custody some embroidered clothes and other female garments which, he said, belonged to the eldest daughter of Maiya, who was married in Bhajjal. The probability is that Rama, the son-in-law, finding the disease had broken out in his own village, conveyed all his wife's best clothes over to Parowal, or that the father-in-law came and took them away to avoid the unpleasant and destructive process of disinfection. This practice has been a very common one in Garhshankar Tahsil throughout the epidemic. On plague breaking out in a village, villagers immediately either convey their best clothes to some other village, or hide them in some convenient place of concealment in or about their own houses.

H.—(10). GARHSHANKAR.

| | | | | | | |
|--|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 6,000 |
| Roll-call, May 1898 | ... | ... | ... | ... | ... | 5,854 |
| Muhammadans (chiefly Rájputs) | ... | ... | ... | ... | ... | 3,298 |
| Other Hindus (chiefly Khatri and Brahmins) | ... | ... | ... | ... | ... | 1,443 |
| Chamárs | ... | ... | ... | ... | ... | 135 |
| Sweepers | ... | ... | ... | ... | ... | 478 |
| Number of houses | ... | ... | ... | ... | ... | 1,278 |
| Do. do infected | ... | ... | ... | ... | ... | 124 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 157 actual 217 |
| Do. deaths do. | ... | ... | ... | ... | ... | 75 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 82 |
| Date of first case | ... | ... | ... | ... | ... | 23rd March 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 30th do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 30th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 30th do. |
| Do. evacuation of village... | ... | ... | ... | ... | ... | 2nd May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 8th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 25th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 23rd do. |
| Do. return to village | ... | ... | ... | ... | ... | 9th July 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 15th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 15th do. |

From about the 23rd of March suspicions began to be entertained that plague was present in Garhshankar, but it was not till the 29th that any positive evidence was obtained, when the son of a barber, called Atu, was found suffering from plague. As a matter of fact, from a list prepared for me by the Hakims of the town, I find that there had been at least six deaths from plague before the case in Atu's house was discovered, and from information received from the inhabitants, I am inclined to think that the disease broke out first in the houses of some Rájputs who had relations in Birampur. The lambardár of Gambo Khana Patti tells me that these Rájputs used, when the cordon was on at Birampur, very frequently to go into the infected village for the purpose of enquiring about the welfare of their friends, that they used to do this either secretly or with lime carts thus evading the cordon, and in short that

there was almost daily intercourse between the Rájputs of Garhshankar and Birampur during time the cordon was placed round the latter village. Infection having occurred in Garhshankar, as the people strenuously resisted all efforts at segregation and made every attempt to conceal their cases, it was no wonder that the disease spread rapidly in the town, and as the cordon was owing to several circumstances very imperfect, surrounding villages during this period became infected also.

H.—(11). SANWALI.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 165 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 154 |
| Muhammadans (chiefly Rájputs) | ... | ... | ... | ... | ... | ... | 98 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 11 |
| Chamárs | ... | ... | ... | ... | ... | ... | 45 |
| Number of houses | ... | ... | ... | ... | ... | ... | 34 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 8 |
| Do. plague cases recorded | ... | ... | ... | ... | ... | ... | 16 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 9 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 7 |
| Date of first cases | ... | ... | ... | ... | ... | ... | Unknown. |
| Do. do. recorded | ... | ... | ... | ... | ... | ... | 4th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 4th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 4th do. |
| Do. evacuation do. | ... | ... | ... | ... | ... | ... | 5th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 27th do. |
| Do. completion do. | ... | ... | ... | ... | ... | ... | 3rd May 1898. |
| Do. last case | ... | ... | ... | ... | ... | ... | 10th April 1898. |
| Do. return to village | ... | ... | ... | ... | ... | ... | 4th May 1898. |
| Do. removal of cordon | ... | ... | ... | ... | ... | ... | 5th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | ... | 5th do. |

Thus on the 4th of April plague was discovered in Sanwali, a small village between Garhshankar and Birampur, amongst the Chamárs, and the evidence goes to prove that these people were in the habit of going to Garhshankar to sell wood and buy provisions. Theoretically, they went only as far as the cordon, but really, I am told, they went into the town carrying their loads of wood even into the infected houses.

BILRON.

(See also No. H. 3, page 85.)

About the 12th April a re-infection of Bilron occurred, the source of which was twofold:—

- (1). The first cordon had been removed from Bilron on the 1st April and many of the villagers went out to their fields at once to look after the harvest. Amongst others there went out, one Nihála, Rájput, who had some fields adjoining the Hajipur village area. He stayed in these fields for about a week, not returning to his village, and when he did come in, he was so ill that he died on the following day (12th April). His child was the next patient, and the first cases during the reinfection of Bilron occurred in the Rájput quarter.
- (2). Another focus of infection occurred about the same time in the house of one Gahia, a leech-man, who brought the disease from Garhshankar, and whose sister was a first case in this other quarter of the village.

H.—(12). GARHI.

| | | | | | | | |
|----------------------------------|-----|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 1,696 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | ... | 919 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 46 |
| Jats | ... | ... | ... | ... | ... | ... | 422 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 243 |
| Chamárs | ... | ... | ... | ... | ... | ... | 201 |
| Sweepers | ... | ... | ... | ... | ... | ... | 7 |
| Number of houses | ... | ... | ... | ... | ... | ... | 184 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 48 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 110 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 64 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 46 |
| Date of first case | ... | ... | ... | ... | ... | ... | Unknown. |
| Do. do. recorded | ... | ... | ... | ... | ... | ... | 20th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | ... | 20th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | ... | 20th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | ... | 30th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | ... | 10th May 1898. |

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----------------|
| Date of completion of disinfection | ... | ... | ... | ... | 8th June 1898. |
| Do. last case | ... | ... | ... | ... | 22nd May 1898. |
| Do. return to village | ... | ... | ... | ... | 11th June 1898. |
| Do. removal of cordon | ... | ... | ... | ... | 18th do. |
| Do. village declared free of plague | ... | ... | ... | ... | 18th do. |

From Garhshankar also Garhi became infected, plague was declared there on the 20th April. It had been necessary for some time before this to allow a certain amount of liberty to pass through cordons on account of the harvests; labourers had been allowed to overlap one another between Garhshankar and the neighbouring villages, and to this circumstance is due in all probability the infection of Garhi.

H.—(13). KULEWAL.

| | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|---------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 179 |
| Roll-call, April 1898 | ... | ... | ... | ... | ... | 310 |
| Muhammadians (chiefly Jats) | ... | ... | ... | ... | ... | 127 |
| Jats | ... | ... | ... | ... | ... | 145 |
| Other Hindus | ... | ... | ... | ... | ... | 4 |
| Chamárs | ... | ... | ... | ... | ... | 34 |
| Number of houses | ... | ... | ... | ... | ... | 59 |
| Do. do. infected | ... | ... | ... | ... | ... | 14 |
| Do. plague cases recorded | ... | ... | ... | ... | ... | 27 |
| Do. deaths do. | ... | ... | ... | ... | ... | 13 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 14 |
| Date of first case | ... | ... | ... | ... | ... | Exact date unknown. |
| Do. do. recorded | ... | ... | ... | ... | ... | 15th April 1898. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 15th do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 15th do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 30th do. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 7th May 1898. |
| Do. completion of do. | ... | ... | ... | ... | ... | 12th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 2nd do. |
| Do. return to village | ... | ... | ... | ... | ... | 14th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 20th do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 20th do. |

On the 15th April plague was declared at Kulewal. The first case had occurred some days before, but the exact date of this it is impossible now to find out. The following account of the method in which the disease was introduced there is given by the zaildár of the place. Dula Singh, lambardár of Kulewal, and his brother, Hira Singh, both got through the police cordon at Simul Mazara while it was infected, for the purpose of getting some money from one of the lambardárs of that village. Having obtained the money, they brought it back, wrapped up in a cloth and kept it in their houses. Five or six days after this Chando, wife of Hira Singh, got plague and died. Dula Singh himself was the next case, and he also died.

H.—(14). CHINKOA.

| | | | | | | |
|--|-----|-----|-----|-----|-----|------------------|
| Census population (1891) | ... | ... | ... | ... | ... | 886 |
| Roll-call, May 1898 | ... | ... | ... | ... | ... | 901 |
| Muhammadians (chiefly Rájputs) | ... | ... | ... | ... | ... | 518 |
| Other Hindus (chiefly Khatri and Brahmins) | ... | ... | ... | ... | ... | 191 |
| Chamárs | ... | ... | ... | ... | ... | 166 |
| Sweepers | ... | ... | ... | ... | ... | 26 |
| Number of houses | ... | ... | ... | ... | ... | 180 |
| Do. do. infected | ... | ... | ... | ... | ... | 10 |
| Do. plague cases returned | ... | ... | ... | ... | ... | 14 |
| Do. deaths do. | ... | ... | ... | ... | ... | 8 |
| Do. recoveries do. | ... | ... | ... | ... | ... | 6 |
| Date of first case | ... | ... | ... | ... | ... | 21st April 1898. |
| Do. do. recorded | ... | ... | ... | ... | ... | 23rd do. |
| Do. declaration of plague | ... | ... | ... | ... | ... | 23rd do. |
| Do. cordoning of village | ... | ... | ... | ... | ... | 23rd do. |
| Do. evacuation of village | ... | ... | ... | ... | ... | 1st May 1898. |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 7th do. |
| Do. completion of do. | ... | ... | ... | ... | ... | 7th June 1898. |
| Do. last case | ... | ... | ... | ... | ... | 7th do. |
| Do. return to village | ... | ... | ... | ... | ... | 17th do. |
| Do. removal of cordon | ... | ... | ... | ... | ... | 22nd do. |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 22nd do. |

In Kulewal itself there were no sweepers, and Buti, sweeper, from Chinkoa, used to work in the house of the lambardár, Dula Singh. After the death of Chando and Dula Singh, Buti was given some clothes belonging to the deceased persons, which he took away to his own house in Chinkoa. The first case at Chinkoa was an old Chamár who lived in the next

house to the sweepers, and had probably a good deal of intercourse with them. This occurred on the 21st April. The next case was in the family of the sweeper himself.

H.—(15). BHAGWAIN.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 357 |
| Roll-call, (May 1898) | ... | ... | ... | ... | ... | ... | 360 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 24 |
| Jats | ... | ... | ... | ... | ... | ... | 103 |
| Other Hindus | ... | ... | ... | ... | ... | ... | 167 |
| Chamars and Ramdasis | ... | ... | ... | ... | ... | ... | 66 |
| Number of houses | ... | ... | ... | ... | ... | ... | 78 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 9 |
| Do. plague cases recorded | ... | ... | ... | ... | ... | ... | 11 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 7 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 4 |
| Date of first case | ... | ... | ... | ... | ... | 12th May 1898. | |
| Do. do. recorded | ... | ... | ... | ... | ... | 19th do. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 19th do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 19th do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 20th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 1st June 1898. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 21st do. | |
| Do. last case | ... | ... | ... | ... | ... | 28th May 1898. | |
| Do. returned to village | ... | ... | ... | ... | ... | 23rd June 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 28th do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 28th do. | |

On the 19th of May Bhagwain was declared infected. About this village the information is a little doubtful, but this much I have been able to ascertain for certain. On the 12th May Mussammatt Jai Devi, wife of Saddu, Jat, died of fever and cough, probably of the pneumonic form of plague. She had been ill for only three days. Four days before her death her brother who was married in Garhi, arrived, stayed the night and took her away with him in the early morning. She came back in the evening, fell ill and died three days afterwards. The first cases, those found on the 19th, were all living in or in close contact with the house of Jai Dei.

H.—(16). PALEWAL.

| | | | | | | | |
|-------------------------------------|-----|-----|-----|-----|-----|-----------------|-----|
| Census population (1891) | ... | ... | ... | ... | ... | ... | 600 |
| Roll-call (June 1898) | ... | ... | ... | ... | ... | ... | 584 |
| Muhammadans | ... | ... | ... | ... | ... | ... | 3 |
| Hindus (chiefly Rājputs) | ... | ... | ... | ... | ... | ... | 480 |
| Chamars | ... | ... | ... | ... | ... | ... | 101 |
| Number of houses | ... | ... | ... | ... | ... | ... | 125 |
| Do. do. infected | ... | ... | ... | ... | ... | ... | 6 |
| Do. plague cases returned | ... | ... | ... | ... | ... | ... | 4 |
| Do. deaths do. | ... | ... | ... | ... | ... | ... | 1 |
| Do. recoveries do. | ... | ... | ... | ... | ... | ... | 3 |
| Date of first case | ... | ... | ... | ... | ... | Not stated. | |
| Do. do. recorded | ... | ... | ... | ... | ... | 3rd June 1898. | |
| Do. declaration of plague | ... | ... | ... | ... | ... | 3rd do. | |
| Do. cordoning of village | ... | ... | ... | ... | ... | 3rd do. | |
| Do. evacuation of do. | ... | ... | ... | ... | ... | 13th do. | |
| Do. commencement of disinfection | ... | ... | ... | ... | ... | 15th do. | |
| Do. completion of do. | ... | ... | ... | ... | ... | 12th July 1898. | |
| Do. last case | ... | ... | ... | ... | ... | 12th June 1898. | |
| Do. return to village | ... | ... | ... | ... | ... | 16th July 1898. | |
| Do. removal of cordon | ... | ... | ... | ... | ... | 21st do. | |
| Do. village declared free of plague | ... | ... | ... | ... | ... | 21st do. | |

At Palewal the disease started in the house of one Nathu, a *baid*, of whom there is very strong evidence that he used to go through the cordon at Garhi to treat the people there who were ill of plague. A rumour to this effect reached my ears at the time when the first suspicious case at Palewal occurred, and my suspicions were confirmed by the fact that when the patients from Garhi were removed to Palewal, the people in the segregation camp at the latter place said to the *baid* in the hearing of the hospital assistant :—" See, here are your friends from Garhi from whom you brought us the plague; go and sit with them; you have no longer anything to do with us."

So much for the detailed account of the origin and spread of the plague epidemic in the Hoshiarpur District. There is, it will be seen, a distinct history of an origin through human agency in eleven of the total of seventeen villages effected throughout the outbreak; and in the six remaining villages there is some suspicion as to its having started in a like manner.

Remarks on the mode of infection of villages.

It will be seen from the previous pages that 86 separate villages in all were infected in the two districts. Six, *viz.*, Jhandher Khurd, Khatkar Khurd, Bahrwal, Karnanan, Aur and Bilron, had either a recrudescence or a reinfection of the disease. The mode of infection is unknown in 14 cases. But it was traced to human agency in 67 cases out of the remaining 72 villages. There was a history of clothes or property having been conveyed in 15 cases of these cases, and the infection seems to have been carried by rats in five cases.

It is therefore pretty clear that human agency is the chief cause for the spread of the disease from one locality to another, and that any means which stops people from leaving an infected locality will also tend to prevent the spread of the disease. In almost every case the first action on the part of the authorities on finding plague was to place a cordon round the infected areas, so that the declaration of plague in a village and the placing of a police cordon round that village were usually synonymous. But on carefully studying the foregoing reports we find that the infection had been carried to new villages in 26 instances before any cordon was placed round the area, and that it spread in 48 instances after such a cordon had been regularly constituted. Of these the actual person who transferred the disease is not known in 4 cases before cordoning, and in 3 after cordoning. But that it was human agency seems fairly probable. It must be borne in mind that the villagers must always be the first persons to know that plague exists among their number and that there is always time for people to run away before the plague authorities arrive on the scene. Concerning this inadequacy of the cordon to stop the spread of the disease we have special remarks to make in another place (see page 126).

The villages from which most other villages were infected were: (1) *Khatkar Kalan*, which infected Birampur, Jhandher Khurd, Khan Khanan and Shikohpur; (2) *Shikohpur*, which infected Mallupota, Sahlon, Katharon, Kamam, Simul Mazara and Bika; (3) *Birampur*, which infected Purkhowal, Deron, Salh Kalan and Gunachaur; (4) *Purkhowal* infected Rampur Bilron, Balon and Salh Kalan; (5) *Mallupota* infected Mehlgahla, Dahan, Bahrwal and Mazari, while (6) *Mehlgahla* infected Ladhana; Jhikka, Sodhian (?), Naura and Bhaura. These six villages were therefore the direct cause of 26 other villages being infected. The following table shows at a glance from which villages each new village got its infection. It will be seen that the disease in some cases passed through 5 villages during the ten months it was under observation.

Castes of those who transmitted the disease to new villages.

The following table gives the castes to which the persons belonged who carried the disease from one place to another—

| | | | |
|---------------------------|----|--------------------------------|---|
| Hindu Jats | 22 | Dhobis and Durzis | 2 |
| Chamars and Sweepers ... | 14 | Muhammadan Arains | 2 |
| Brahmins and Khattris ... | 7 | Gujars | 2 |
| Jhinwars | 5 | Hindu Rajputs | 2 |
| Lohars and Tarkhans... .. | 4 | Nai, Muhammadan Rajputs, Teli, | |
| Faqirs | 3 | Qazi, Sahnsi, each... .. | 1 |

As the great majority of the population was Hindu, the proportion of Hindu Jats, Brahmins and Khattris is not large. But the Chamars is certainly excessive, while the large number of Jhinwars who were active in spreading the disease is certainly surprising. There were usually only a few of this caste in each village, and only fifty of this caste were attacked with plague (see table Appendix B) throughout the Jullundur District. The reason for this result is probably to be found in the fact that they, like the Chamars, are often sent to give notice of deaths, &c., to other villages and also that they are frequently used to surreptitiously carry off infected clothes to relatives in distant villages.

As to the question of the infection being carried by clothes, the notes of the various Medical Officers on the matter are very meagre. But as people usually accompanied the articles and as any means which would check the migration of persons would also check the transference of articles of clothing, &c., the matter is not of very great importance from the point of stopping the spread of the disease.

RATS IN CONNECTION WITH PLAGUE.

The connection which rats have with plague requires more than a passing reference. It is very important to know whether these animals transmit the disease from one human being to another, and if so, to what extent they are responsible for its spread. The medical officers working in the Banga Circle saw so many evidences where the only rational deduction to be drawn was that they had carried the disease from one house to another, that we came to look upon it as an established fact that rats could, and did, transmit the infection. But since reading the notes made by other officers working in other circles, where they seem to doubt that rats play any very important part in the conveyance of the contagion and lay great stress on the point that personal contact between human beings is always necessary for the spread of the infection, we feel that it is advisable to review again the ground on which we built our faith.

Before going into the facts related to plague, it is necessary to draw attention to some of the well-known natural habits of rats as without recognizing these we are likely to miss the importance of certain differences which these animals show when plague is present in their neighbourhood. The form of rat here referred to is the common brown rat (*Mus Decumanus*). They are shy, timid animals, which come out from their hiding places mostly at night or at times when no human beings are about and when all is silent and still. At the slightest sound or movement they scuttle away and are soon out of view. They love dark secluded places, and in consequence are not much observed by the ordinary native in whose villages they live. Indeed it is surprising what great changes may take place in the life and habits of the domestic rat which will pass unobserved. They usually live in large numbers where grain is stored; but they eat almost every kind of food even to offal, and under ordinary circumstances need very little water for their sustenance. In fact they are often met with in store-houses, so far from any liquid whatever, that it is a matter of conjecture whether they ever get water at all.

There is probably no village in the province where rats are not found, and found in fairly large numbers. They gnaw holes through wood, *kacha* walls and other fairly hard material and make free communications between the various houses in the village, which are occupied by people of different castes and who have no dealings or intercourse with each other.

In April last, a new bungalow was built for the officers on plague duty in a field about a mile from Banga and over a quarter of a mile from the nearest village. It was found necessary to keep a small quantity of *ata*, sago,

rice, &c., in stock, in one of the rooms for the use of the plague hospitals. The grain was brought in an *ekka* from Phagwara, a town thirteen miles away and unloaded and recarted at Behram, a village five miles away. It therefore seems unlikely that any rats should have come hidden away in so small a quantity of grain (about ten to twelve maunds altogether), and yet within a fortnight, the rats became a pest in the room in which the grain was placed on account of not only eating through the sacks, but also from burrowing in the floor and walls. It is therefore extremely likely that these rodents had migrated from one of the surrounding villages and that they came very soon after the house began to be inhabited. In fact it is pretty well recognized that rats have communication with other rats in neighbouring villages and that they are capable of travelling from one village to the next. This species is said to have been introduced into England and Europe from Asia by means of shipping, and in less than a century has spread all over the Continent and almost banished the indigenous black rat (*Mus Rattus*) out of England (*vide* Sterndale's "Indian Mammalia," page 323). Another peculiarity about these animals, which seems to be fairly well recognized, is that if poison be put down in their vicinity and a few of their number are killed by eating it, the rest of their community leave the locality in a body and the place becomes free of rats. Indeed, it does not seem necessary to even kill the rat to produce this result. If one of their number be caught and then tarred over, singed, or in some other way disfigured or tortured, and then allowed to go loose again, it is stated that a general emigration of rats takes place.

Now let us survey the facts connected with plague. That these animals get the disease with extreme ease is now generally admitted. In Bombay it was found that inoculating a rat with plague bacilli almost invariably produced the disease and the bacilli could afterwards be discovered in the blood, spleen and other organs, and could be transmitted to other rats; that placing healthy rats in company with the diseased ones caused them after a few days to take the illness and that sometimes they died when fed on "infected food." When a rat dies of plague, it dies in a peculiar way. It does not creep away into some secluded and out-of-the-way corner where it will be undisturbed and where it can die in peace as is usual with rats about to die. But it comes out into the open and ceases to notice its surroundings. The dog or the man, from whom it naturally flees away on ordinary occasions, is now quite unheeded. It wanders about in an aimless, tottering way, and the general manner of describing it, which we have heard both in Bombay and here, is that it looks "as if it were drunk or mad." It grows weaker and weaker and eventually falls on its side and dies, wherever it happens to fall, it may be the middle of the room, the courtyard, or even in the open street. If it can get near water it goes for it at once and drinks greedily as if it were suffering from unquenchable thirst. In its eagerness to do this, it often falls in, and then it makes very little attempt to get out again and is consequently drowned.

Dead rats found in numbers in or near plague infected houses. In the villages in the Jullundur District we have had many instances of large numbers of rats dying; in one case, at Mokundpur, Dr. Wilkinson reports, that nearly 200 dead rats were found in an infected house; in another house at Mehlgahla, as many as fifteen dead rats were found. Many instances are recorded in the previous section of this report of rats being infected and dying before the occupants of the houses. The dead rats are not found always in the house where cases of plague have occurred, though this is frequent enough, but in the houses surrounding it. At Khatkar Kalau there seems to have been a special period—the beginning of August last year—when the mortality among rats was particularly noticed. The mortality must have been very heavy or the rats must have emigrated, for when we disinfected the village, not a single rat was seen, in spite of there being large quantities of grain lying about. But when we went to an outlying portion of the village, called the Pindora, where the Bharais lived, and which was separated from the rest of the village by a large pond, the place was found to swarm with these little animals. There had been no cases of plague among the Bharais, who are a caste of Muhammadan beggars. This difference between the two sections of the village with regard to the rats was so noticeable, that it was remarked on by the ignorant members of the disinfection gang as being something which required explanation.

One fact which has been brought constantly before us in the present epidemic was the curious way the disease has spread from one house to the next, and has taken several houses in succession regardless of all apparent connection between these houses. Indeed, in many cases the houses have had their entrances in different streets and have been occupied by castes which have no intercourse with each other. At Khan Khanan one of the first houses to be attacked with plague was that belonging to a Khatri named Bhagwana. Adjoining his house, at the back, but having its entrance in another street, lived a Tarkhan or Sikh carpenter named Bhagwan Singh. These two families had nothing to do with each other. One day, soon after the Khatri's house had been infected, Bhagwan Singh and his family noticed a rat coming out of a hole in the wall. This hole we afterwards discovered led into the Khatri's house. The family noticed that the rat took no notice of their presence and that it was more or less *behosh* (unconscious) and after wandering about for a short time lay on its side and died. When this description was given us we at once recognized that the rat had died of plague. The following day several members of Bhagwan Singh's family were attacked with plague.

Another marked instance at Khan Khanan was in the case of a block of buildings near the gateway. The first person to be attacked here was a Jat girl aged twelve years. The only entrance to this house was by the road leading to the main gate of the village. The next house to be attacked in this neighbourhood was one which had its back to this one and opened into an alley which led from a street in the village. This alley was inhabited entirely by Ramdasis who had no dealing with the Jats next door. The infected Ramdasis' house touched by one corner a house belonging to the Chamars. Up to the time the Chamars left the village, which was about November 29th, no cases had occurred among them, but on going out into camp, Indi, the wife of Roora, was attacked. She must have been infected in the village. On going into the village we were surprised to find that her house was the one next to the Ramdasis' house. The Chamars' quarters had no direct communication with the Ramdasi's quarters, nor had the family attacked anything to do with the other two families.

This house to house infection has been so common in our villages that it would only be tedious to continue giving instances. But one more marked instance might be quoted. When we arrived at Ludhana Jhikka on May 21st we found only two families attacked, a Jat family belonging to Narain Singh's and a Muhammadan family belonging to Sain (five cases). It was afterwards ascertained that Salamat, wife of Sain, was the first to be attacked. These Muhammadans lived in a little courtyard just outside the village. To enter the Jats' quarters, one had to take a long tortuous course along lanes which apparently led to the middle of the village. But on mounting the roof of Narain Singh's house one at once perceived that the passage along which one had entered had gradually curved back again towards the Muhammadan's quarters, and though the roof of the latter was much below the Jats' houses, the two houses were only separated by a cattle-shed. The houses were close to each other; but there could not have been any direct communication.

The obvious criticism to these facts, produced to show that house to house infection in many cases takes place by rats, is that the people in the various houses spend much of their time on the house tops, and as these are chiefly flat with only a small ridge of mud to show the boundary between the different houses, free intercourse must take place and infection may after all be communicated directly from person to person. There are reasons for believing, this is not the case to any large extent, because as we shall show in another place, plague is very little infectious in the open air. It is this fact which has made the total evacuation of the villages so successful. But a stronger argument is that we have unfortunately had many instances where houses have become infected after the inhabitants have left them.

To refer again to Mehlgahla, the entire village was turned out on March 17th. Up to that date only the Chamars and sweepers had been affected, not including the one Jat girl who had brought the disease from another village. The rest of the village appeared perfectly free from infection. Even after the people got into camp, no one except Chamars and sweepers got infected. Eight days after the evacuation of the village the disease seemed to

Infection continues to spread in a village after the inhabitants have left it.

have died out. At the end of March the disinfection of the village was commenced. The Chamars' quarters being first treated. More Chamars at once got infected from their homes. On April 6th a Jat who had been inside the village which had been uninhabited for twenty days was struck down with plague. At the time we were very hard pressed for labour and were obliged to allow the villagers to do a great part of their own disinfecting, under the supervision of the Sanitary Inspector. They did not take the same care and precautions which our trained coolies did, and it was soon found that each time a new *mohulla* was commenced some of the people working in that *mohulla* were attacked with plague. Numerous dead rats were found all over the village. Nobody had noticed rats dying before the village was evacuated. Here we have two important facts before us. The village, except the kamins' quarters, was free from infection before the people left on March 17th; it was virulently ineffective when they began to return twenty days later. No disease had been noticed in the rats before the people left; they were found to have died in numbers when the people returned, and died in such a way that it was practically certain that they had died of plague. It is very difficult not to run to the conclusion that it was the rats which had spread the infection from the Chamars' quarters all over the village.

Again, in the case of Banga, as already described, the people when they

In Banga, the people who remained in their houses after dead rats were found in them got plague, those who evacuated their houses immediately on finding the rats escaped.

left their *mohulla*, locked up their houses, and went into camp and remained under police supervision. The disease soon stopped among them. Their houses were afterwards disinfected. The gang of workmen who did this, being carefully looked after, did not get infected. But after a longer or shorter period the people living in the adjacent *mohullas* began to see rats affected with plague. On this occurring, those who were immediately ejected from their houses escaped, while those who remained became quickly attacked.

It is facts like these which in the end convinced us that though human intercourse is an important factor in the spread of plague in a village, still rats play an equally important part. It is because rats so readily carry the disease from house to house that all methods which try to deal with an epidemic of this disease by treating only those houses where cases of plague have occurred are bound to fail. We cannot control the movements of rats, whether diseased or healthy, and this consideration alone should force us to treat every village as a whole. What is the good of segregating and keeping under rigid police supervision a few infected people when rats are carrying the disease to almost every part of the village?

The next question which presents itself is—granting that rats spread

(2). Can rats carry infection from one village to another?

the disease to every part of a village where the malady has already been introduced by some other agency, can rats convey the disease from one village to another, or from one locality to another some distance off?

This is a much more difficult question to settle and is beset with greater difficulties. Up to the present, in the Jullundur District, diseased rats, or indeed healthy rats have not been seen going from one village to the next; nor have dead rats been found any distance away from human habitations. Both these are occurrences which one would expect to find if migration of diseased rats took place on any large scale. Then, again, the introduction of the disease by human agency has been proved in so many of our villages, that one is inclined to believe that it was probably due to this cause even in the few villages where we were unable to find any direct or even indirect evidence of its introduction. This is a very fair inference to make. One cannot be expected to believe in any "theory" or "hypothesis" for which one has no facts in support. For a time we all more or less believed that man and man alone carried the disease from one place to another, till one or two villages got infected in a curious way, at the end of March, and this made us think over the matter in a new light.

At this time of year instead of having isolated villages situated some distance away from previously attacked villages we were getting new plague villages springing up all round our old villages and the disease seemed to be

spreading faster than we could hope to cope with it, if it continued at the rate it was then progressing. The increase began in February, when ten villages were discovered; was at its height in March and April, when twenty-three and twenty-nine infected villages, respectively, came to light, and then the spread ceased almost as quickly as it had started, there being only seven new villages discovered in the following months. The only general conditions which prevailed during March and April, which differed from the previous conditions, was that the weather was getting rapidly warmer, and the corn ripened, was cut, threshed and stored during this period.

There was heavy rain in the beginning of February, when the increase first started, but afterwards the weather was unusually dry. The meteorological conditions were those which in other districts (Karachi and Scind) have been found favourable to the early checking of the epidemic, and may therefore be discarded in the present argument. The conditions of the crops may have had some direct or indirect effect. The wide increase of the disease corresponded with the appearance of the ear in the corn, and its decline with the filling and closing of the granaries. This may have been accidental but the point will be referred to later.

At the beginning of March we noticed that three little villages, named Mehrampur, Chak Kalal and Batuli, were almost surrounded by plague infected villages, and from our previous experience we felt pretty certain that these villages would get infected sooner or later. It was therefore well worth our while to try and save them before they got infected. Mehrampur consisted mainly of Jats and was intimately connected with Khan Khanan, a village which had been infected, but had already been declared free again. Chak Kalal consisted of Aluwalian who had some caste-fellows in Banga, and Batuli consisted of Mubammadan Arains who had relatives in other villages but none near. With the people's consent Mr. Johnston put both Mehrampur and Chak Kalal out in camp. Batuli was not touched, and as the map shows was one of the few villages in the middle of our area which escaped the disease. Mehrampur also escaped. But of course it will always remain a doubtful point whether going into camp saved it or whether it escaped in the same way that Batuli did.

With reference to Chak Kalal the case is rather different. Up to the time the people went out into camp no one had been attacked; but it had been noticed that the rats in the village were dying in a curious manner. The people went out on April 7th. On April 15th, eight days later, the sky became clouded over with dense clouds and there was every appearance of heavy rain. The people got anxious as they thought their huts were not sufficiently well-built to keep out the wet. They therefore, without waiting for orders, returned to their village for shelter. Numerous dead rats were seen lying about the houses. After being there for one or two hours, the people returned to the camp. The next day the lambardars came to the Plague Officer's camp and reported that there were a number of dead rats in their village. They were ordered to bring some up for examination. This they did the following morning (17th). They brought a rat which had only just died. On microscopical examination it was found to contain typical plague bacilli in large numbers in its spleen, and the bacilli grew in a characteristic way on ordinary agar-agar. The same evening two persons of the village were attacked. After which followed a severe epidemic in which thirty-two persons were attacked and nineteen died.

In this case there seems little doubt that the people got the infection from the diseased rats, which had begun to die ten days before the first human being was attacked. The question arises how did the rats become infected? It must either have been from diseased rats coming from one of the surrounding villages some of which were less than a mile away, or it is possible that "infected" articles, such as clothing, may have been brought from an infected village and the rats been infected from them. Indeed, on the 25th March, we turned a man named Sunder Singh and his family, out of this particular village into camp, because he was supposed to have been to see a man suffering from plague at Sotran some days previously. But as he and his family never contracted the disease, he was allowed after ten days to return. None of his family ever contracted the disease. It is therefore unlikely that he brought the disease.

In two other villages—Punian and Lalpur—the rats are said to have died before any one in the village was attacked with plague. In the case of Punian this was noticed eight days, and in Lalpur “a few days” before the first case. Next to Punian and only 110 yards distant is a small Muhammadan village called Hamirowal, although it had no direct communication with Punian, which was a Jat village, it was thought advisable to evacuate it at the same time that the other village was turned out. It consisted of only 28 houses. When it was disinfected it was found that rats had begun to die in it. No less than thirty dead rats were found in this small hamlet.

In these four villages the following common conditions existed :—

- (1). The people belonged to a different caste to the people in the surrounding villages and were therefore unlikely to have had very intimate dealings with them; Punian was an exception.
- (2). When plague started in the village instead of having one or two primary dropping cases, we had a regular outburst in the first three or four days. Thus :

| | 1st day. | 2nd day. | 3rd day. | 4th day. | |
|----------------|---------------|----------|----------|----------|----------------------|
| Chak Kalal ... | 3 | 3 | 7 | 7 | |
| Lalpur ... | 3 | 1 | 2 | 2 | All women. |
| Punian ... | 3 | 1 | ... | 3 | Five women, two men. |
| Hamirowal— | not attacked. | | | | |

- (3). All the villages named had their rats affected during the month of April.

Since writing the above, I have read Dr. Wilkinson's remarks about a fifth village (see page 60).

The village of Lehl is also one where there is no direct evidence of infection and where the rats are said to have died before any one was attacked. The epidemic also began in a sudden way. Two people were attacked on April 12th, one on the 13th, four on the 14th, and two on the 16th. The village is situated about a mile east of Sirhal Mundi, from which it was supposed to have got its infection. This village was also attacked in April.

From these facts we are inclined to think that though it is not a common mode of infection, rats may sometimes carry infection from one village to another. But all the links in the chain of evidence have not yet been produced. It has been a common experience with us to find that when we are doing the disinfection of villages all the rats which were known to have previously inhabited the place have then left it. Rat holes, covered up with wet mud (*garah*) by our disinfectors, remain untouched. What become of all these rats? Do they remain in the fields as appears to have happened at Mokandpur, or do they after a time return to their own or other villages? In April the corn was being cut. Did the clearing of the fields drive the rats which were then living in them and feeding on the standing corn back into the villages, and if so, did it drive infected rats into these five villages in which the people state that the rats began to die of the disease before human beings were attacked? These are all points which, with our present information, we are not in a position to answer definitely.

One more point before we close the section. Rats do not get ill immediately they are infected. Even in the case where they are inoculated with plague and where they show symptoms quickest, two or three days may elapse before they become ill, and if they get the infection in other ways, the period of incubation is longer. There is, therefore, ample time for them to migrate to neighbouring villages before they get ill.

A few rats dying is sufficient cause to make the others leave the locality. This was found to have happened in Khatkar Kalan, Mokandpur, Garbshankar, Haphowal, and several other villages. They would not remain out in the fields for very long, as this variety of rat is essentially a house variety. It seems to us extremely probable that many would migrate to other villages, as they have been known to do in health. If healthy rats migrate to other localities, nothing is more probable than that “infected” ones would do the same. We cannot, therefore, ignore the supposition that these animals convey the disease from one locality to another, though it may be to a much less extent than human agency.

SECTION II.

MEASURES TAKEN TO COMBAT THE EPIDEMIC.

As previously stated, the plague staff in the infected area was divided into two divisions.

1. *The Inspecting Staff*—whose sole duty was to find the existence of plague and to report it to the officers in charge of the other division. They had nothing to do with the cordoning of villages, segregating the people or treating the sick. Their one and only duty was to find plague. The details of this staff is described on page 124 and their methods criticised.

The Observation Staff.

The Executive Staff.

2. *The Executive Staff*.—This consisted of a staff of European officers, including Assistant Commissioners, Medical Officers and District Superintendents of Police, with their appropriate subordinates.

The Assistant Commissioners were in general charge of the operations, and were responsible for adequate arrangements being made for the butting, feeding and general comfort of the people placed in camp. They also supplied huts for hospitals, police and the plague staff. All stores, lime, &c., were indented for through the Assistant Commissioners, except medicines and disinfectants, which were supplied direct by the Civil Surgeons of Jullundur and Hoshiarpur.

Duties of Assistant Commissioners.

All accounts were kept by these officers, and all payments made through them.

They also kept a record of all the operations; sent in a daily diary and reported to the authorities of other districts when persons escaped from infected areas.

The Medical Officers were in charge of the general medical arrangements and the subordinate medical staff. They diagnosed the cases of plague, and informed the Assistant Commissioner in charge. They also made immediate and adequate arrangements for the removal and segregation of the sick. The hospitals and all arrangements for the treatment of the sick were in their exclusive charge.

Duties of the Medical Officers.

They fixed the sites of the camps in consultation with the Assistant Commissioner. The disinfection of the villages was carried out under their supervision, and they inspected and passed as completed each house separately after disinfection. It rested with them to declare when a village might be considered free from disease. They were responsible for the daily inspection and roll-call by hospital assistants of all the persons placed in the healthy, segregation and hospital camps.

They carried out plague prophylactic inoculations. They had compiled in their office the daily sick return and kept the hospital and disinfection registers.

Under them were assistant surgeons, hospital assistants, compounders, hospital and disinfecting establishments.

The Police Officers were responsible for the police cordons round the various villages. At one time there were nearly 8,000 police on plague duty.

Duties of the Police Officers.

Measures carried out on the discovery of plague in a village.

On the discovery of a single case of plague the first thing done was always to place a police cordon round the infected village or area, and to prevent all ingress or egress. If people had gone temporarily to other villages, such as to the nearest shops for necessities,

Cordoning the villages the first operation.

they had to appear before the police inspector in charge of the cordon, who, after having all the circumstances of their case written, allowed them to enter the cordoned area. But no person under any circumstances whatsoever was allowed outside this area without a written pass.

This cordon was not removed again till the village was declared free of plague.

The importance of placing an efficient cordon as early as possible cannot be over-estimated. However important it may be to treat individuals and to protect the immediate neighbours of plague-stricken people, it cannot compare with the enormous importance of protecting other villages and other communities from being infected. In fact our first duty was to try to check the spread of the disease ; our second, to try and exterminate the disease in the places where it had already got a footing. Our cordons were therefore our first line of defence, or at least they ought to have been so.

Immediately after the cordon was established, a nominal roll of the whole village was made by the patwári or some other responsible person. After the inspecting staff had been properly organised nominal rolls of this kind were kept ready prepared in all the villages for miles round the infected area, and all that was necessary when plague was found was to have a muster-call of the people. In this way we had a ready means of inspecting everybody present in the village, and of telling whether any one had left the locality, and if so, enquiry from the neighbours rendered it easy to find out what had become of such people. The Assistant Commissioner made lists of all absentees, and communicated with the authorities of the districts to which they had gone. In this way they could be traced, watched or returned to their village, as circumstances allowed. This method rendered it possible to trace the disease at an early stage into other villages. From Mallupota alone the absentee list showed that one plague-stricken patient had fled to Jbandher Khurd and another infected one to Mehlgahla.

When, at a later stage of the operations, we got the people into the various camps, it was by reference to the village lists that we were enabled to determine whether we had every one under our observation. With the help of these lists the hospital assistants made out their lists for the roll-call and inspections of the individual camps.

The next stage was the arrangements for the evacuation and hutting of the people. Usually on the receipt of the report of plague the Assistant Commissioner gave orders to the *mistri* in charge of the hut-building depôt to send off the number of huts required, and long lines of bullock-carts laden with grass and *sirki* huts would be seen wending their way towards the newly-found village within an hour or two of the information having been received. In one case, *viz.*, Shikohpur, the Medical Officer reported plague on the evening of February 1st, and by 3 P. M. the following day two hundred huts had reached the village, which was situated ten miles from the depôt.

But often, especially during April and May, when plague-infected villages were springing up suddenly and daily round us like mushrooms, it was quite impossible to get huts made quick enough to keep pace with the demand. Fortunately the weather was dry, and we were able to turn out the people without waiting for huts to arrive. In many cases the villagers built themselves most excellent shelters. But we are strongly of opinion that this should not be allowed, unless Government huts are not procurable.

It very frequently happens that after people go out into camp, and even in the so-called healthy camps, fresh cases of plague occur—in fact, this is almost the rule for the first few days after evacuation. This necessitates the patient being moved to hospital, his relatives and belongings being sent to the hospital or segregation camp, and the hut being burned. If it happens

Nominal rolls made in all infected villages and afterwards of every village within the infected area.

Evacuation of the infected villages and forming of plague camps.

It is recommended that Government huts should whenever possible be provided.

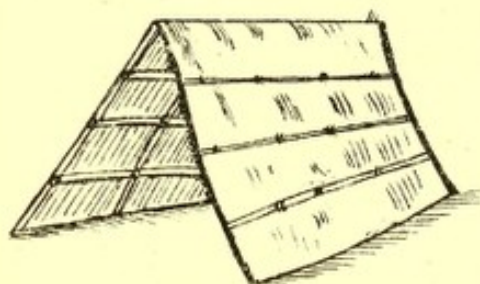
to be a Government hut no difficulty occurs; and as these are very cheap the loss is inconsiderable. But if, on the other hand, the man and his comrades have built the hut, they have usually used their *ballahs* or span *karias*, or even, at the time, unused ploughshares or other agricultural implements: often two or three families club together to make a common hut. In all these cases the difficulties which arise at the burning of the shelter tend to make the owners discontented and to harass the medical subordinates who have to carry out the requisite measures. The huts made by the villagers may be, and usually are, more comfortable than the Government ones; but they certainly do not let in the same amount of light and air, and are, therefore, not so serviceable for the present purpose.

The formation of camps is also an important matter. The Assistant Commissioner and the Medical Officer ride round and select suitable sites. High ground near wells form the best situations. Trees are useful in winter, as they provide shelter for the cattle, and in the hot weather become necessary for shade. But camps should never be formed actually in groves, gardens or woods, as the people do not usually get the full benefit of the air and sun, they are more difficult to get hold of and inspect. Frequently when a camp is situated in a *bagh*, the headman or the owner takes possession of it for himself and his friends, and the rest of the people have to find shelter as best they can. In some cases so much room is taken up by the *maliks*, that there is not only no room for the others in which they can place their huts, but they have no shady place to sit in during the day. Another reason for not using these gardens is that, in the Jullundur District, they are often used as latrines.

But some of the best sites for camps were selected near groves of trees and then there was plenty of room to everyone to sit under the shade during the hours when the sun's rays beat down with relentless force.

The camps were selected with due regard to the various castes and communities which were present. The general division into—(1) *Healthy Camps* for communities who had no illness among them, (2) *Segregated or Suspected Camps* for people who came from infected *mohallahs*, and (3) *Hospital Camps* for the relatives of plague-stricken persons was observed. But often it was found necessary to split up some of these into smaller camps. For instance, there were usually three or four healthy camps—one for Hindus, another for Muhammadans and a third for Chamars and so forth. The huts were arranged in rows leaving wide thoroughfares, 50 to 100 feet wide between them, and each hut was situated 15 to 20 paces from its fellow. This gave ample room between them, and in the event of a hut catching fire, which was not an infrequent occurrence, there was little likelihood of others being implicated.

The huts themselves were of the nature called *jhonpri* by natives, that is to say, they consisted of two sloping planes like the roof of a house, each plane was 8 feet by 10 feet, and consisted of a bamboo frame with *sirki* or grass fastened to it as shown below:—



The centre of the hut stood 6 feet above the ground, and gave a superficial ground area of 100 square feet inside.

In the cold weather triangular backs and fronts were provided. But in the warmer weather the people made their own arrangements about doorways, these usually took the form of cloth *purdahs*. Each hut accommodated on an average five persons, or one family.

They are light, cheap and very portable. When they became old and ragged they could be burned, or if they had been used for police, health camps or other purposes, which did not render them likely to carry infection, they could be taken to pieces and the material used a second time. They were made very easily and in large numbers by the sets of *gharamis*, who were always kept separate from the infected villagers.

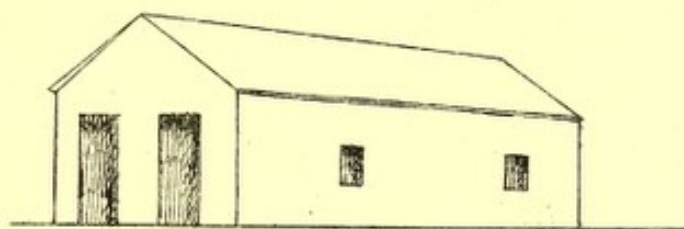
The evacuation of the village was usually carried out by the Assistant Commissioner. In most cases it was an extremely easy matter. The *lambardars* were informed of the situation of the various camps and what class of person was required to go to each. They were then told how long they would be allowed before a second cordon would be placed round the village from which they would be cut off. The former cordon, it will be remembered, was placed round the village area. Thus it will appear that the camps were situated between two sets of cordons. One outside the fields belonging to the village and preventing communication with the outside world, the other round the village site which cut the people off from the focus of infection. This second cordon, we regret to say, was often omitted on account of the small number of police in proportion to the area they had to cordon. We have many instances on record where people went back to the village to get little articles they required, and were promptly infected and subsequently attacked with plague. But we could not make bricks without straw, and if we had no police for the purpose we could not use them. Village *chaukidars* and hired watchmen were tried, but were found absolutely useless, as they were easily intimidated by threats or weeded round by the smallest bribes.

After the order for evacuation was given the people packed up their property and streamed out in lines like ants to their various camps. It usually takes a whole day for people to get out all they want, and we allowed them a second day to get articles which, in the hurry of packing up and getting out they may have forgotten. After this the village was out of bounds and the camps became their temporary homes. They usually remained in these from six weeks to two months—not a very long time, considering the virulence of the disease we were combatting.

After the people had been brought out the hospital assistants were placed in charge of the various camps. Their duties consisted of holding a roll-call twice a day of all present, examining all cases of sickness and reporting daily all cases of plague or any absentees which may occur. The roll-call was usually held twice a day, but when hospital assistants were few compared to the people they had to examine, we were obliged to be content with one roll-call daily. We found that a hospital assistant could in this way look after from 800 to 1,000 people. These roll-calls were most important, and we draw especial attention to them here because some of the authorities who were not actually on the spot, seem, for a time, to have been absolutely ignorant of their existence. They never caused any inconvenience to the inhabitants, as the subordinates went from hut to hut, and therefore no one was obliged to leave his work or his food. By means of these inspections we were enabled to find every case of plague. In fact the rise in the number of "fresh cases" in Table IV, page 118, was mainly due to the fact that cases which remained hidden in the village were very soon brought to light when the roll-calls were in working order. Last, but not least, the roll-calls prevented persons from leaving the village area and wandering very far away. Several cases, where people habitually broke the cordon, have lately come to our notice, but they were unable to wander very far away as they had to return for the next roll-call. These inspections were therefore one of the means by which the disease was prevented from being spread to any distance. A very good instance of this is that of Hari Ram, Patwari, living at Mallupota. This man had his home at Shahpur,

a village 15 miles away on the other side of Nawashahr. He wanted to get his property to his own village, but he was not able to get so far away with a bullock cart without missing a roll-call and being found out, though it was easy enough for him to break the cordon at night. He therefore sent his things temporarily to Bahrwal, an uninfected village just beyond the cordon round Mallupota. Thus, he most effectually infected not his own village, 15 miles away, but the one next to the village he was in. In the same way Moti Ram, who was patwari of Shahpur, but lived at Mallupota, is supposed to have brought the infection to Mazari. But, as already stated, on page 40, the chain of evidence is not so complete as in the last case. We, therefore, look upon these daily roll-calls as our second line of defence in preventing the spread of the disease.

While the village was being evacuated all plague cases were sent to the hospital. For this purpose, sheds made chiefly of bamboo and *sarwar* grass or *sirki* were employed as in the case of the other huts. But as we required larger space with more accommodation for the sick, the huts were strengthened with wooden beams (*ballahs*). Each shed was 28 feet long and 16 broad. The side walls were 8 feet high, from which the roof sloped upwards to the centre of the shed; the central ridge being 10 feet to 12 feet high. These sheds contained ten patients with ease, and sometimes twelve without inconvenience. The inside superficial area was 448 square feet, and the cubical area 4,480 cubic feet. Each patient therefore had 448 cubic feet. This, considering the porous nature of the buildings which allowed of free interchange of air, was found ample. The following is a sketch of one of the hospital sheds:—



The number of such sheds erected depended on the number of patients. At Khatkar Kalan there were two, in Banga, Punian and Gunachaur, four. At Khankhanan, where we had our largest number of patients, *viz.*, seventy at one time, and at Sirhal Qazian we used a long shed, 108 feet long and 16 broad. These make excellent hospitals, but take longer to erect, and are not as easily moved about as the small ones are.

The ground was beaten down and plastered over with mud and allowed to dry. When it had become hard and dry, it was washed over with fresh lime-wash. This was renewed every morning when the weather allowed. The floor was thus kept clean and, if properly done, there was never any fine dust flying about. The inside of the sheds were also sprinkled with phenyle each morning. In this manner they were kept sweet and clean, and there was seldom any smell or oppressive feeling noticed in entering them even at night.

Besides the main sheds for the occupation of patients there were small ones for other purposes. There were three (10 feet by 12 feet) with sloping roofs; 10 feet high in the centre and 6 feet at the sides.

Smaller huts for cook-house, dispensary and establishment, &c.

1. One was used as a dispensary.
2. Another as a cook-house.
3. And a third for bathing patients on their admission to, or discharge from, hospital.

Besides these there were smaller huts of the usual "lean-to" pattern, already described, which were used for—

1. Hospital assistant and compounder's quarters.
2. Bhistie, ward orderlies and sweepers' quarters.
3. Observation shed for suspicious cases.
4. Mortuary.

The *dhais* used the same kinds of huts as the hospital assistants. But when European nurses were attached to the hospital we had larger and more comfortable erections. They were built of the same materials as the other huts, but were 24 feet by 10 feet. This allowed of a centre-room 10 by 12, a verandah in front 6 by 10 and a bath-room behind, of the same dimensions as the verandah. The roof sloped from 10 feet in the centre to 6 feet at the sides. They made very comfortable quarters in the cold weather, but were unbearably hot during the hot weather. In fact we were obliged to get most of our nurses into *pucca* buildings during June and July.

In some cases the sheds were all raised on mud plinths about 6 inches high. This we consider an improvement. But time should not be wasted making them when sheds are urgently required.

All hospital buildings were surrounded by shallow trenches to carry off any rain which might fall.

Latrines made of *sirki* and without roofs were placed in convenient places near the hospitals.

In Appendix A will be found a list of establishment furniture, drugs and sundries which have been found useful.

In the Jullundur District we had 16 fully equipped hospitals as follows:—

- | | |
|--------------------|---------------|
| 1. Khatkar Kalan. | 9. Meilgahla. |
| 2. Jhandher Khurd. | 10. Banga. |
| 3. Khaokhanan. | 11. Katt. |
| 4. Khatkar Khurd. | 12. Bisle. |
| 5. Sirhal Qazian. | 13. Pharala. |
| 6. Shikohpur. | 14. Punian. |
| 7. Mallupota. | 15. Jagatpur. |
| 8. Gunachaur. | 16. Chhokran. |

In these places large numbers of patients were treated. But smaller hospitals with few drugs, &c., were established at almost every village. Only in the case of several villages lying close together was one hospital utilized for more than one village at a time. The reason of this was that the villagers, always suspicious of our motives, objected to having their relatives taken away.

The Muhammadan burial grounds and the Hindu burning *ghâts* require consideration. These were selected as far away as possible from the camps, though within easy reach of the hospital. A hospital assistant or a compounder was always placed in charge. He was responsible that people carrying away plague corpses did not mix with other people, and was always present during the funeral ceremonies, and personally supervised the bathing in phenyle of all persons attending the funeral before their return. Graves were dug to the depth of 6 feet; the official in charge being provided with a measuring stick for this purpose. In the Hoshiarpur District plague corpses were buried in quick-lime. But this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. If sufficient lime be not used the body instead of being quickly disintegrated is only preserved. However, if the body is buried sufficiently deep there are practically no chances of any ill-effects occurring. The plague germs cannot live in the absence of air, and therefore quickly die out in corpses which are buried deeply. It is stated that no ill effects have taken place from the opening up of any of the great plague pits of London.

But burning is certainly the most satisfactory way of dealing with plague corpses. The Hindus, therefore, in this respect, have a great advantage over all the other castes with whom we have had to deal. The hospital assistant was responsible that sufficient wood was always used to completely burn up the body. Many of the Jats in the Jullundur District used *gobar* (cow-dung made into cakes and dried in the sun), as well as wood. These gave great heat, and economised the wood which was scarce. In cases where the relatives or friends were unable to supply fuel, this was given by Government. The object was always to dispose of plague corpses as soon as possible.

The next point to attend to, after the people had got into camp, was the disinfection of the camps. This *primary* disinfection did not usually extend to the health camps, but was almost always carried out in the case of the segregation camps, and in any camp in which the disease showed signs of not quickly stopping.

The plan was as follows:—The people were first made to entirely empty out their huts and spread out everything on the ground. Every box had to be opened and every sack undone. The hospital assistants then came round with garden syringes, and thoroughly soaked everything with strong phenyle solution. All earthenware articles, as well as all cooking utensils; small iron and copper implements, &c., were dipped in a vessel containing the same solution. Beds, boxes, almirahs, &c., were squirted with the same. Articles such as grain, seeds, flour, &c., were simply exposed to the sun. But a special point was always made of turning them out of the receptacles in which they were kept. Cotton, hemp, bundles of string (*ban*) were merely sprinkled with phenyle. The subsequent placing them in the sun to dry them probably amply "disinfected" them. In fact one is strongly of opinion that the unexpected success which always followed on the disinfecting of the camps was as much due to the purifying effects of the sun's rays which was resorted to to dry everything, as to the amount of phenyle which we sprinkled about.

The people themselves were also made to take phenyle baths. Men, women and babes were all treated. The European nurses supervised the bathing of the women. The large iron vessels in which the people of these districts boil the sugar-cane juice for making sugar, and which are called *karahas* made excellent baths. They were also used for boiling the clothes of plague patients.

In addition to this disinfection the people in all the camps were made to put out all their property in the sun for four hours daily for ten days after getting into camp.

The Disinfection of the Village.

After the people had been comfortably butted in camp, the cordons fixed, and the various camps disinfected, the source or rather the chief focus of infection had still to be dealt with;—we refer to the infected houses. It is astonishing how long infection remains in and about the rooms and buildings where cases of plague have occurred—that is when nothing has been done to kill the contagion. In Mehlgahla people returning to the village 40 days after evacuation were attacked; at Khankhanan 38 days; at Kariha 30 days; at Mallupota 31 days, and at Bahrwal 24 days after the village had been emptied. We remember a case in Bombay where a Parsee family on getting one of its members attacked promptly locked up the house and left the island. Seven months afterwards these people heard that plague had practically ceased in Bombay, and they returned to their house. Although they had been free from the disease for seven months, the day after their return, another member was attacked. It is most probable that he was infected from his own house. These instances show that the infection can remain a long time in buildings. Another point of interest and importance which the present epidemic has illustrated is the fact that the infection spreads,

and may spread to every part of a village, after the inhabitants have left their houses. This has already been referred to. It is only mentioned here to emphasize the importance of the disinfection of the whole village.

The method of disinfection as carried out in the Jullundar and Hoshiarpur Districts consisted of four stages or divisions, each having a special object. The stages were as follows:—
The disinfecting operations consisted of four stages. (1) Disinfecting with antiseptic solutions; (2) Cleaning, (3) Ventilating; and (4) Whitewashing. Possibly one or other of these processes may have been sufficient, but on account of the difficulty of making sure, or indeed guessing the position of the infection, and also being sure that every part of the building and every article contained in it had been thoroughly disinfected, made it necessary to go through the whole process wherever practicable. For instance, strong antiseptics might have been played on to every wall, floor and ceiling in every room; but when the inspecting officer came round a few hours later not a sign of the antiseptic would be seen, as the earthen walls take up the moisture and dry quickly. Thus another time, a room, which had never been touched, might pass as one disinfected. In the processes carried out by us, there was no possibility of any room remaining unfinished as long as proper care was taken in the inspecting. Thus, even if a room remained untouched by the antiseptic, the subsequent opening up of the roofs, lime-washing of the walls, &c., which all could be seen by the inspecting officer, even days afterwards, left little chance for the plague germs to remain alive.

Establishment on disinfection work.

The following is the establishment usually employed:—

1. A hospital assistant was usually placed in charge of the operations. These men are certainly the best persons for this work. We tried four European Sanitary Inspectors. But, on the whole, the hospital assistants were more satisfactory. They have sufficient medical knowledge to grasp the essentials of disinfection, they are hard-working, and most of them fairly reliable. Being natives they can stay in the streets and houses in the villages during the whole day in the hottest weather, which few Europeans could possibly do. The disinfection of the villages is one of the most important stages of the plague combatting operations. If it is badly done and plague makes its appearance again when the people return to the village the whole of the operations have to be gone through a second time; a contingency, not at all pleasing either to the people treated or to the staff who have to carry out the work. It is therefore very essential that the man in charge of the disinfecting gang should be thoroughly reliable. Drs. Wilkinson, Smith and Walton adhere to the opinion that hospital assistants are the best men for this work, while Dr. Clark would like to have European subordinates; but has not tried them, and Dr. Coleman found kanungos made very satisfactory disinfecting overseers. This latter class was tried and found quite useless in the Banga Circle.
2. A police sepoy of good character was usually associated with the hospital assistant. He was useful in keeping the disinfecting gang in order in the temporary absence of the hospital assistant; he prevented, in most cases, the occurrence of thefts. He was also available for making lists of property before the Magistrate when owners were absent, and could be trusted with keys of houses, &c.
3. Water-carriers.—Usually two were required for each gang of 50 coolies.
4. Coolies.—These consisted of three kinds—
 - (a) Coolies for using the pumps and syringes for playing a stream of antiseptic on the interior of the houses. We were obliged to place each pump in the hands of some particular coolie who was responsible for the instrument, otherwise, if used indiscriminately by everybody, it soon got roughly handled and out of order.
 - (b) Coolies for lime-washing.

- (c) Sweepers for general cleaning up and burning of old rags, rubbish, &c.

The coolies were usually the Chamars of the village. Some, who showed themselves particularly smart, were taken on for other villages besides their own.

The disinfecting work, even when carefully done, is very dangerous, and a large number of the men employed throughout the operations have been attacked. Dr. Clark does not agree with this statement (*vide notes*, page 157). But his experience was gained during the hot weather when the infectiousness of the disease was at its lowest ebb. It was very different in the cold weather, when in spite of all our precautions persons became attacked. But we agree with him that the more carefully the precautionary measures are carried out, the less likely are any of the workers to contract the disease. In fact under the supervision of some of our best hospital assistants very few attacks have occurred.

Disinfection of houses is dangerous work.
Precautionary measures taken to prevent workers on disinfection becoming attacked with plague.

The following are the most important directions to be observed by the disinfecting staff:—

1. All persons working in the gang must wear shoes, and no person should be allowed to enter any house or building with bare feet.
2. The gang should be inspected daily before beginning work, and all persons with cuts, scratches or sore places on their hands or legs should not be allowed to work till these abrasions have healed.
3. The disinfecting gang should be particularly warned of the danger of raising the dust. When roofs are being opened, or floors dug up, coolies with pumps should always be at hand and spray water or phenyle solution over the dry earth as it is being removed. Men on this work should tie their *pugris* over their mouths.
4. When the gang takes its midday meal, all should wash their hands outside the village, and the persons who bring the food should not be allowed to mix with the gang who should be kept separated in an open field while having their food.
5. The gang should be given a phenyle bath, or at least have the phenyle spray from the hand-pump played on them before leaving the village in the evening.
6. No person whatever should be allowed to smoke a *hukka*, or eat his food inside an infected village.
7. No person should be allowed in the village, unless brought in by the hospital assistant to open his house or watch his property while it is being disinfected. He should always be placed in a position of safety.
8. The disinfecting gang should all, if possible, be inoculated with Haffkine's prophylactic medium.

Materials used in disinfection.

The materials used in disinfection for an ordinary village were as follows:—

1. Antiseptics (see below).
2. Continuous action hand-pumps, or large garden syringes.
3. Buckets.—Excellent iron-buckets were made out of old phenyle tins, or lighter, but less substantial ones out of old kerosine tins. The village *turkhan* or *lohar* fitted handles to these at a very small cost.
4. One or two iron vessels, called *karahas*, for mixing the fresh lime for lime-washing.
5. Spades for opening up mud roofs, digging floors, &c.

6. Baskets for carrying away earth, rubbish, &c.
7. Ladders.
8. The iron-buckets with rope attached (*döl* and *laj*) used for drawing water from wells.
9. Two *mashaks*.
10. Lime.—This was always unslaked (see below), called among natives *anbuja chuna*, and great care was taken to see that it did not get affected by damp before it was used. The usual estimate was half maund for each house in villages. But in small towns, such as Banga, where the houses were larger and had more rooms, a larger quantity was required.
11. Country brushes for lime-washing.—These were made by the *gharamis*, who make the *chappar* huts from a kind of grass called *munj*.
12. Some sort of colouring matter for marking infected houses, &c.—The red earth called *kurmachi*, which can be procured in almost every village, mixed with a little mustard oil makes an excellent paint for this purpose. Every house, known to have had plague cases, was marked with a circle and cross as has been done in other plague areas. A horizontal line drawn below the circle and cross indicated that the house belonged to a plague infected family, but that the persons had been attacked in camp. Two or more circles and crosses represented two or more cases. In the Hoshiarpur District a rather different mark was used to designate plague houses; a circle was drawn with a vertical line down the middle, on the left was a number, representing the serial number of the house, on the right the space was divided by a horizontal line into two, the upper one had a figure representing the number of people attacked in the house, and the lower space contained the initial or some distinctive sign made by the inspecting medical officer, and was only filled in when the disinfection of the house had been completed.

Stage I.—Spraying with disinfectants. When houses had to be disinfected the following procedure, which applied to all the buildings in the village, whether actually known to be infected or not, was carried out. The disinfecting gang was collected in the street near the house, and all the materials required were placed in readiness in some convenient open space, if possible near the centre of the area to be dealt with. The owner of the house was brought in by the hospital assistant, or the constable from the camp where he was living and allowed to open the lock of his door, and then made to sit down in the street, somewhere where he would not be in the way, and where he could watch all that was being done to his house and property. But he was not allowed to take any active part in the disinfecting or to enter any of the rooms till they had been disinfected.

With pumps and syringes a stream of antiseptic solution was made to play on the closed doorway till the wood-work was thoroughly wet. It may seem unnecessary to begin using the antiseptic so soon. But the object was to impress the workers that they had to deal with infected places, and it was necessary to teach them thoroughness from the very commencement and to insure the good work, without which the object, for which they strove, would not be obtained. The door was then thrown wide open, and before anyone was allowed to enter a stream of antiseptic was made to play over as much of the interior of the room as was visible from outside. Thus the dust inside was layed, and it was fairly safe for persons to enter. The pumpmen then went inside, and from the centre of the room continued the pumping till every part of the ceiling, walls and floor were wet and running with antiseptic solution.

Other coolies now entered and carried out into the open every piece of furniture, or movable property, while they were still wet with the lotion, and placed them either in the roof in one corner, or in some convenient place in the yard or even in the street where they could get the full benefit of the direct rays of the sun. All rubbish, rags or articles of no value to the owner were taken out into the open and burned. Small articles, such as *datis*, *rumbis*, *dewas*, &c., were dipped bodily in vessels containing antiseptic fluids which were kept in readiness near the doorway. The owners were encouraged to take as much as possible of their property away into their camps after it had thus been thoroughly disinfected.

Corn, seeds, flour, *haldi* and such articles which would be spoiled by placing in water were spread out in the sun for a day; the vessels which had contained them were disinfected *secundum artem*, and, when dry, the various materials were returned. Books and manuscripts were also exposed to the sun's rays.

The dry places, left by removing articles from the rooms, were at once tackled by the pump-men, who directed a jet of antiseptic towards every space thus left undone. In the same way, articles removed were subjected to a thorough drenching with antiseptic, when they got outside.

A word or two about the antiseptic used is necessary.

Of all the drugs which kill germs, perchloride of mercury is the strongest and most effectual. It is used in laboratories and for delicate surgical operations, on this account—Dr. Watkins-Pitchford and others have shown, in a series of careful investigations, that a solution of 1 in 5,000 destroyed the plague bacillus in five minutes with certainty.

When we began the plague operations in the Jullundur District we used perchloride of mercury, or sublimate solution, as it is often called, 1 in 2,000. But we very soon found that there were disadvantages connected with this form of antiseptics. The water in the district contained a large quantity of lime salts which precipitated the mercury salt as a fine powder, and rendered the solution we were using inert. This defect could be overcome by adding sulphuric acid to the solution. But then the acid and salt attacked our metal pumps and syringes. It is true, we could have sent to Lahore or elsewhere, and had wooden pumps made. But this would have taken time and our work was urgent. But another and more serious drawback to perchloride was that it is a virulent poison, and, even with the weak solutions we were using, there were likely to be accidents; especially as our disinfecting gang were at that time perfectly uncultured and did not seem to realize that the solution they were using was likely to do them harm.

We therefore decided to try another antiseptic, which though not so powerful as perchloride, still would be powerful enough to kill the bacillus, and would have the additional advantage of not being so poisonous to human beings, and would not corrode our pumps or spoil the metal articles with which it would come in contact. Phenyle was the antiseptic fixed on. It does not form a true solution in water, but mixes freely as a very fine emulsion, looking very like milk. It has a distinctive odour, is quite easy to manage, and has the additional advantage of not spoiling clothes and other articles which are disinfected. It kills plague bacilli in five minutes in solutions of 1 in 400 (*vide* Dr. Watkins-Pitchford's report from the Petit Laboratory, April 23rd, 1898). The direction given to our workmen was to pour enough phenyle into the vessels of water to make a dense white fluid looking like milk. On testing our samples of phenyle we found that 1 in 400 made a thin bluish white fluid which on pouring into the palm of the hand was transparent. But that when made, as directed above, to the consistence of milk, we were using solutions of the strength of at least 1 in 200. This, therefore, was amply strong enough for our purpose, was easily and quickly prepared from the crude phenyle in tins, and was not likely to cause toxic effects on those who had to use it on a large scale, and did no damage to clothes, furniture or implements. After nearly ten months' experience of this antiseptic we feel that it has answered every purpose for which we required it. In some of the

larger, double-storied infected houses in Banga, where we could not get direct sun-light through many of the rooms, and where the walls were made of rough brick, which did not take the lime-washing, we had to trust entirely to phenyle lotion made as here described. The result was quite satisfactory.

As an extra precaution, plague patients' clothes, when not burned, were subjected to a bath of boiling phenyle of the above strength. We now feel that the boiling was quite superfluous.

To return to the disinfecting.

When the hospital assistant or other inspecting officer was satisfied that the room had been thoroughly saturated with the antiseptic, he had the doors of the room shut, and coolies went on to the flat roofs and made a hole in it, large enough to admit plenty of sun-light and air into the room below. An opening of less than 6 feet by 4 was not allowed, and often much larger ones were made in every house of the village. In the case of infected houses the entire roof was removed. In making the openings, called *moga* by the people, it was always necessary to bear in mind the position of the larger beams (*shaktir*) below. For, it is awkward and spoils much of the benefit of the *moga* to have a large beam running through the middle of it. If the opening is not made in the middle of the roof, it should be made on the south side of the centre, as this position allows the direct rays to act on the largest portion of the room. The surface mud of the roof was dug up and placed neatly all round the opening to make a ledge which prevented rain-water from running off the rest of the roof into the room through the *moga*. The *phoos* or grass and matting which lay below the mud was next removed and always burned as it has a tendency to make a litter and to blow about. The rafters (*karian*) were finally taken out and placed neatly on one side.

During the whole of this process dust which was very apt to rise was laid by continually playing a jet of water from a hand-pump through the opening.

The house was then left till the following morning to allow the antiseptic to act and the place to dry. The free ventilation enabled the latter to take place very quickly.

The next day the house was again entered and the rubbish, &c., which had fallen during the making of the various ventilation holes in the roof, was sprayed with phenyle and removed in baskets and buried outside the village.

The walls, pillars, doors, corn-receptacles and all fixtures were afterwards lime-washed by the gang of whitewashers. This coating was prepared in a special way to get the best antiseptic properties. That is to say, the unslaked lime was gradually shaken into the iron vessels before referred to, which contained water, and stirred till a homogeneous mixture was obtained which was quite hot. This was used immediately and was strongly and powerfully caustic. The paper, above referred to, shows that it is germicidal at the strength of 1 in 1,000.

The workmen had to be careful to protect their hands when using this material, as it was apt to blister the skin.

After the lime-washing the disinfecting arrangements were complete, and the house remained open to allow of thorough drying till the people were ready to re-occupy it, or till the whole village had been completed.

But frequently modifications had to be made in the manner of disinfection to suit circumstances.

The following are some of the instances :—

1. If the rooms were so dark that it was impossible to see clearly whether the stream of phenyle was reaching every part of the apartment, we found it necessary to make the hole in the roof before using the antiseptic spray. It was particularly the case with inner

Large ventilation holes made in the roofs of all houses and the entire roof removed in the case of infected houses.

Lime-washing of houses done with fresh unslaked lime.

Houses left open after disinfection.

Modifications in disinfection.

Opening in roofs not always practicable.

rooms. The process was a more dangerous one, as the rubbish falling from the roof often raised the dust lying about the room, and which is particularly dangerous. If there is one point of more importance than another in disinfection work, we should consider it the prevention of causing dust to blow about in infected houses.

2. Many houses contained large quantities of stores, such as wheat, sugar, treacle, &c., which could not be left out in the open, or in rooms in which large portions of the roof had been removed, for fear that they might be spoiled by rain or damp. In these cases the opening in the roof was made well to one side, and the articles, after having been exposed to the sun for the requisite time, were arranged in the sheltered portions of the apartment. They thus benefited by the free percolation of the outside air, without being liable to get wet.

3. Many *pucca*-built houses, and especially double-storied ones, had their rooms built in such a way that making an opening in the ceilings of the lower rooms gave very little inlet to the sun's rays, or making such openings would render the house unsafe. In these cases we had to depend more on the disinfecting with phenyle and the white-washing.

4. In many shops which were little more than cupboards with one side open to the road it was often unnecessary to make an opening in the roof. In other cases better ventilation was obtained by making an opening in the side wall instead of the roof.

5. Houses known to be infected were treated with greater care than the others. Besides removing the whole roof as already mentioned, the floor, if made of mud, was dug up to the depth of three inches, and the earth carried outside the village and buried. This was a dangerous process, and entailed much labour. We have since seen some reports from Bombay, in which it is stated that this process has now been given up as being quite unnecessary.* The floor is most likely the most infected portion of the room. But as it is usually quite hard and the germs are probably only on the surface, the antiseptic which is always washed all over it, during disinfection, ought to destroy effectually whatever germs may happen to be present.

All articles such as old string beds, old clothes, old wooden furniture, *muhras*, *pihis*, *binaris*, all earthen vessels and articles, which from their porous nature are difficult to treat with antiseptics, should be burnt or destroyed, and compensation given. Many of the articles mentioned above will be found cheaper to pay for than to disinfect.

6. In many of the houses we found corn-receptacles, made of mud and called *pharolis* or *kathis*, according to their size and shape. These were always emptied, phenyled inside and out, and finally entirely white-washed. In order to do this thoroughly, they were moved into the middle of the room and sometimes turned over on their sides. In a few cases it was found necessary to break them up altogether.

7. Out-houses, cattle sheds, stables, &c., which were often very roughly built, and had walls so irregular that it was almost impossible to white-wash them, were often left without this coating. But more attention had to be paid to the phenyle spray. Care was always taken to have them properly cleaned out. It was a common practice to try and hide articles in these places, in order to avoid having them disinfected.

When we started the plague operations, we were rather inclined to treat infected houses on rather a different footing to uninfected ones. But experience soon showed us that the infection was not confined to the houses with the red circle and cross on the doorway. In the great majority of cases, where we were able to determine the house from which the disinfectors were attacked, we found that it was from a house which had been free from infection when the village was evacuated. As already stated this late infection seems to have been due to rats coming into and dying in these houses. We

The question of leaving infected houses till last and beginning disinfection in uninfected quarters.

* Bombay Medical and Physical Society's Reports, 1898.

therefore thought that by unroofing and opening out the infected houses first, we might possibly be driving diseased rats out of their own quarters into other parts of the village. With a view to testing this point, latterly, we took the village as a whole and began at one end and went steadily through to the other. This plan, theoretically, allowed time for the rats to die in their own localities, and moreover left no dark secluded corners in the uninfected houses, already, done for them to go to. We had certainly very few attacks after this date. But the disease had then shown a marked tendency to diminish with the onset of the hot weather, and this may account for fewer disinfectors being attacked. The test was therefore not conclusive.

In May an order was issued that ten days should elapse after the village had been evacuated before disinfection should be commenced. The idea was to allow the rats to die in the infected houses before these were disturbed by opening up the rooms, and thus driving the diseased animals to other localities. This caused a good deal of delay in the work, which was often very irksome, and tended to prolong the time the people were in camp. None of the medical officers on plague duty seem to see much advantage in the rule, as of course plague-stricken rats have a natural tendency to wander about in an aimless way, and were found to have reached other localities, and to have died there even after this rule was carried out. There were fewer people attacked. But, as mentioned above, this may have been due to the weather and not to the measures adopted.

After the village had been thoroughly cleaned, disinfected and white-washed, the question arose,—when would it be safe to re-occupy it? We are of opinion that a village can be re-inhabited the day following the completion of the disinfection. But we must make certain that all infection has ceased in the camps. It is therefore essential that a certain time should elapse after the "last case" in order to see that all the other people remain well. The usual time allowed was three weeks, and this was found quite satisfactory. But in the middle of the cold weather and in February when the disease did not die out so quickly, after people went into camp, we allowed a month to elapse after the last case, before permitting the return to the village. We are of opinion that the fortnight allowed in Medical Circular published last year, is too short a time, as in two or three instances (Khatkar Kalan, Khankhanan, &c.), we have had a dropping case in the camps after an interval of two weeks' freedom from the disease.

Before the people return to their homes they are all bathed in phenyle and their clothes and property disinfected in the manner described in Primary Disinfection of camps on page 107. Great care has to be taken to prevent people smuggling their clothes, &c., into other villages, corn fields, or even into other camps in order to try and evade the purifying operations.

After the people returned to the village, they were still kept under observation for ten days, in order to make sure that no infection remained in the houses, which would probably show itself within this time. The hospital assistants made daily house to house visitations, and the medical officer in charge had a final muster and roll-call of the whole village at the end of the period; after which the cordon was removed and the village declared free of plague.

THE EFFICACY OF DISINFECTION.

The efficacy of the disinfection of the villages is now beyond doubt. Among the 70 villages treated in the Jullundur District and 16 in the Hoshiarpur District, making a total of 86 villages and 22,015 houses, disinfected, of which over 1,412 were known to be "infected" houses, the disease only made its appearance again in 6 cases. The details of these are interesting, as they show that it was not the disinfection which was in fault, but in some cases the omission of it which caused the difficulty. In the other cases the re-appearance was due to re-infection of the village.

The details were as follows :—

1. *Jhandher Khurd* was declared free on 28th December 1898. A carpenter was traced from Mallupota, from where he had run away, and found at Jhandher Khurd on 19th February 1898 with plague on him. He and the family with whom he lodged were placed in camp, and the house disinfected. The disease did not spread. This was, therefore, a case of re-infection.
2. *Khatkar Khurd* was declared free on 22nd February. A Chamar woman, whose husband sold grass at Banga, was attacked and died. Two families only were evacuated, among whom two more cases occurred. The disease did not spread in the village. As none of the Chamars had been attacked previously, and as the Jat families, who were attacked in the previous outbreak, remained well in their houses, at the opposite end of the village, it is extremely probable that this attack was due to re-importation from without.
3. *Rarnana*.—In this village a single case was found on 28th February. As the man had only lately arrived from Kamam and the case was obviously an imported one, he was removed to Kamam hospital; his shop, where he was living, disinfected, and the village was declared free on 29th March 1898.

The village was not evacuated at this time. But on 6th April the

hospital on February 1st, which is said to have come from Bur. Then again on July 23rd some cases were discovered, for which the whole village was evacuated and disinfected. It is uncertain whether these are cases of re-infection or re-appearance of the disease. But as the village had not been disinfected, it could not be due to failure of our measures in this respect.

6. *Rampur Bilron* was declared free at the end of March. But cases were found again on April 12th. Dr. Clark has shown that these were cases of re-infection from Purkhowal. But the village had only been partially treated, and therefore we were not surprised to find that the disease spread.

These few recurrences of the disease, when examined, only tend to confirm the proof that our disinfecting measures were effective in stamping out plague in the villages. They also tend to show another point which should not be overlooked. *If plague is introduced into a village, recently disinfected, it shows little or no tendency to spread, and the evacuation of one or two houses is usually quite sufficient to check the second outbreak.* This is very different from our experience of villages before disinfection. We have at present no data to show

Plague re-introduced in a village after disinfection does not spread.

how long the benefit of the disinfection lasts. But it is probably two or three months. Nor can we say to what particular detail in the disinfection this immunity is due. But we have a strong suspicion that it is due to the absence of rats in the village.

THE EFFICACY OF EVACUATION.

The total evacuation of villages has been carried out on a very large scale in the Jullundur and Hoshiarpur Districts, and we are now in a position to review the records of the cases of plague occurring in these villages, both before and after evacuation, and to draw deductions as to the result of our measures in regard to the epidemic.

We may preface our remarks by stating that, as far as we know, no epidemic of plague, however mild, has ever been known to die out naturally in any locality under four or five months, and in most records it is very much longer than this. Therefore, if, after we have carried out any measures for the suppression of this disease, we find that the epidemic stops in a shorter time than this, we may fairly assume that this beneficial result has taken place as a consequence of these measures. Moreover, if we find that the disease treated in this manner, in a number of villages taken in sequence, stops in each village in which we adopt these measures, regardless of the time it has been present previously in the village and also in spite of adverse circumstances, such as the cold weather, when the disease has a tendency to become worse, the benefit of the measures becomes practically proved.

We have taken all the villages in the Jullundur District which have been attacked by plague, and of which we have very accurate records, and, without any discrimination whatever, have placed them in sequence in the accompanying table. (See Table IV on pages 118-19.)

It will be seen that between October 21st, 1897, to July 23rd, 1898—a period of nine months—75 villages in all were evacuated. These include Jhandher Khurd, Khatkar Khurd, Karnana, Aur and Barhwal, where there was a re-appearance of the disease, which have already been discussed on page 114. Karnana and Aur were not totally evacuated on the first occurrence of the disease, but were subsequently turned out, and Khatkar Khurd, Jhandher Khurd and Barhwal were totally evacuated when the disease was first found, but not subsequently when a re-infection took place. It was then found quite sufficient to only evacuate the infected houses. Naura is therefore the only infected village in this area which has not been, sometime or other, totally evacuated.

In the table, columns C and D give the probable date of the first case, corresponding to the date of onset of the epidemic, and the date of total evacuation of the village. The difference of these two dates gives the period which elapsed while the epidemic existed within the village. Column E gives the number of cases which occurred during this period. But it is probably not a full list, especially in the case of the earlier villages attacked. It will be noticed that, as the staff for the inspection of villages was increased, and the machinery for the early detection of cases improved, fewer attacks occurred in the villages before they were evacuated.

Under the heading "F" are 20 columns which give the daily record of cases found in each infected village for the first twenty days after evacuation. It will be noticed that for the first four days after evacuation the total number of cases occurring, instead of diminishing, actually increased. Thus at the bottom of the table, we see that, in the 75 villages under consideration, there were 155 new cases on the day following the evacuation; on the second day 165; on the third 183; and on the fourth day 189 cases were recorded. The reason for this is obvious. The effect of the evacuation would not show itself at once, because a certain period exists between the time the people caught the infection and

the time the first symptoms showed themselves. This period varies, according to the statements made by the medical officers in Bombay, from one to ten days. So that a community being infected in the village and then leaving would show cases from one to ten days afterwards. The present table tends to show that in the vast majority of cases the symptoms develop within five days after the infection has been contracted.

There is another reason for this large increase. As long as the people remained in the villages, it was very easy for them to hide their cases. As a matter of fact, they often did so. Thus, in a large number of our villages after their evacuation, the hospital assistants in making their roll-calls and inspections in the camps came upon cases which had obviously been ill some time. These discovered cases were entered in the registers on the days they were discovered, as it was often impossible to determine, at once, how long the person had been ill, and besides, entering them in the registers according to the date of their attack, would necessitate the altering and confusing of previously prepared records.

From the fifth to the twentieth day, a rapid and almost continuous decrease will be noticed, in the table, in the number of new cases admitted to the hospitals; and in 37 villages out of 75, or in 42 per cent. of our villages, the disease had entirely ceased within this period, and instead of having a total varying between one and two hundred cases a day, as in the first few days after evacuation, we had only 9 cases in our 75 villages. Had we continued the daily columns for some further period, as, for instance, till the thirtieth or fortieth day after evacuation, the decrease would have continued. But, as in a great many instances we found that cases occurring after the twentieth day were due to other causes, such as people surreptitiously entering the village, or from people on disinfection work being attacked, &c., &c., we have contented ourselves by merely giving the total number of attacked after the twentieth day in column H.

Table V drawn up by Dr. Hunter gives the result for the 16 villages in the Hoshiarpur District. The same remarks apply to this table as have been made concerning the Jullundur villages,—except that there is no rise of cases in the first three days after evacuation. There is an almost continuous fall from the date of evacuation to the twentieth day.

Table VI gives the time, in days, which elapsed between the total evacuation of the village and the date of the last case, regardless of how people contracted the malady, whether from the village or not;—that is to say, not taking into consideration any of the causes which tended to prolong the epidemic after evacuation.

Table No. IV.
Showing the effect of Evacuation on the Epidemic.

| A. | B. | C. | D. | E. | F. | | | | | | | | | | | | | | | | | | | | G. | H. | I. | K. |
|------------|------------------|---|--------------------------------|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------------------|---|-----------------------------------|----------|
| | NAME OF VILLAGE. | Probable date of outbreak (i.e., first case). | Date of evacuation of village. | Total number of cases before evacuation. | Columns showing the number of attacks, day by day, for the first twenty days after evacuation. | | | | | | | | | | | | | | | | | | | | Total of last 20 columns. | Total number of cases which occurred after the twentieth day of evacuation. | Total number of cases up to date. | REMARKS. |
| Serial No. | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | | |
| 1 | Khatkar Kalan | 28th April 1897 | 28th Oct. 1897 | 68 | 2 | 2 | 4 | 2 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 8 | 3 | 79 | |
| 2 | Jhandher Khurd | Unknown | 11th Novr. " | 9 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 18 | 2 | 29 | | |
| 3 | Khandbana | " | 6th Decr. " | 115 | 5 | 8 | 8 | 6 | 1 | 6 | 1 | ... | 2 | 1 | 3 | 1 | 1 | ... | ... | ... | ... | ... | ... | 45 | ... | 175 | | |
| 4 | Khatkar Khurd | 23rd Decr. 1897 | 23rd " | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 6 | ... | 10 | | |
| 5 | Shikohpur | Early in " | 2nd Feby. 1898 | 23 | 6 | 6 | 6 | 6 | 6 | 5 | 3 | 1 | 5 | 1 | 4 | ... | ... | ... | ... | ... | ... | ... | ... | 50 | ... | 75 | | |
| 6 | Sirhal Qazian | 25th Jan'y. 1898 | 13th " | 25 | 1 | 4 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 3 | 2 | 1 | 2 | ... | ... | ... | ... | ... | 31 | 26 | 82 | | |
| 7 | Mallupota | 28th " | 21st " | 43 | 1 | 5 | 4 | 8 | 4 | 3 | 2 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 41 | ... | 91 | | |
| 8 | Gusachar | 2nd Feby. " | 1st March " | 92 | 9 | 6 | 11 | 1 | 4 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | ... | ... | ... | ... | ... | ... | 51 | 4 | 147 | | |
| 9 | Jhandher Khurd | 12th " | Not evacuated | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | | |
| 10 | Sahlon | During Jan'y. " | 4th March 1898 | 46 | 2 | ... | 7 | 8 | 4 | 8 | 6 | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | ... | 58 | 3 | 107 | | |
| 11 | Melgahla | 22nd Feby. 1898 | 17th " | 16 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 25 | 69 | 101 | | |
| 12 | Kanam | 20th " | 6th " | 11 | 3 | 7 | 4 | 3 | ... | 6 | 2 | 4 | 3 | 1 | 1 | 1 | 1 | ... | ... | ... | ... | ... | ... | 38 | 22 | 61 | | |
| 13 | Jagatpur | 21st " | 10th " | 32 | 4 | 2 | 3 | 4 | 3 | 1 | ... | ... | ... | ... | 3 | 1 | 2 | 3 | ... | ... | ... | ... | ... | 26 | 5 | 63 | | |
| 14 | Khatkar Khurd | 27th " | 28th Feby. " | 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | ... | 2 | | |
| 15 | Katharon | During Jan'y. " | 10th March " | 10 | 1 | ... | ... | 1 | ... | ... | ... | 4 | ... | ... | 1 | ... | 4 | 2 | 1 | ... | ... | ... | 14 | ... | 38 | | | |
| 16 | Karnana | 28th Feby. " | Not evacuated | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | | |
| 17 | Belon | 16th " | 4th March 1898 | 2 | 1 | 1 | 2 | 2 | 4 | 1 | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 22 | 4 | 29 | | |
| 18 | Lakhpur | 1st March " | 14th " | 6 | 1 | 7 | 2 | 5 | 1 | 1 | 3 | 1 | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | 25 | 31 | 31 | | |
| 19 | Narpur | 28th Feby. " | 9th " | 12 | 2 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4 | ... | 13 | | |
| 20 | Lodhipur | 14th " | 10th " | 11 | 2 | 4 | 8 | 2 | 3 | 5 | 2 | 2 | 1 | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | 35 | 3 | 49 | | |
| 21 | Sah Kalan | 26th " | 15th " | 6 | ... | ... | ... | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 6 | ... | 12 | | |
| 22 | Mahmampur | 7th March " | 14th " | 15 | 3 | 4 | 3 | 4 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | ... | ... | ... | ... | ... | ... | ... | 32 | 9 | 56 | | |
| 23 | Naura | 8th " | 10th " | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | | |
| 24 | Masani | 8th " | 10th " | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | | |
| 25 | Banga | 7th " | 30th April " | 81 | 6 | ... | 2 | 8 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | ... | 29 | | |
| 26 | Kati | 24th Feby. " | 10th March " | 9 | 4 | ... | 6 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 21 | ... | 1 | | |
| 27 | Haphowal | 12th March " | 12th " | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 17 | ... | 3 | | |
| 28 | Chakbigan | 10th " | 15th " | 1 | 4 | 1 | 2 | 3 | 3 | 3 | 2 | 1 | ... | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | 29 | ... | 3 | | |

| | 7th March 1898 | 15th March 1898 | 21st March 1898 | 28th March 1898 | 4th April 1898 | 11th April 1898 | 18th April 1898 | 25th April 1898 | 1st May 1898 | 8th May 1898 | 15th May 1898 | 22nd May 1898 | 29th May 1898 | 5th June 1898 | 12th June 1898 | 19th June 1898 | 26th June 1898 | 3rd July 1898 | 10th July 1898 | 17th July 1898 | 24th July 1898 | 31st July 1898 | 7th August 1898 | 14th August 1898 | 21st August 1898 | 28th August 1898 | 4th September 1898 | 11th September 1898 | 18th September 1898 | 25th September 1898 | 2nd October 1898 | 9th October 1898 | 16th October 1898 | 23rd October 1898 | 30th October 1898 | 6th November 1898 | 13th November 1898 | 20th November 1898 | 27th November 1898 | 4th December 1898 | 11th December 1898 | 18th December 1898 | 25th December 1898 | 1st January 1899 | 8th January 1899 | 15th January 1899 | 22nd January 1899 | 29th January 1899 | 5th February 1899 | 12th February 1899 | 19th February 1899 | 26th February 1899 | 5th March 1899 | 12th March 1899 | 19th March 1899 | 26th March 1899 | 2nd April 1899 | 9th April 1899 | 16th April 1899 | 23rd April 1899 | 30th April 1899 | 7th May 1899 | 14th May 1899 | 21st May 1899 | 28th May 1899 | 4th June 1899 | 11th June 1899 | 18th June 1899 | 25th June 1899 | 2nd July 1899 | 9th July 1899 | 16th July 1899 | 23rd July 1899 | 30th July 1899 | 6th August 1899 | 13th August 1899 | 20th August 1899 | 27th August 1899 | 3rd September 1899 | 10th September 1899 | 17th September 1899 | 24th September 1899 | 1st October 1899 | 8th October 1899 | 15th October 1899 | 22nd October 1899 | 29th October 1899 | 5th November 1899 | 12th November 1899 | 19th November 1899 | 26th November 1899 | 3rd December 1899 | 10th December 1899 | 17th December 1899 | 24th December 1899 | 31st December 1899 | 7th January 1900 | 14th January 1900 | 21st January 1900 | 28th January 1900 | 4th February 1900 | 11th February 1900 | 18th February 1900 | 25th February 1900 | 4th March 1900 | 11th March 1900 | 18th March 1900 | 25th March 1900 | 1st April 1900 | 8th April 1900 | 15th April 1900 | 22nd April 1900 | 29th April 1900 | 6th May 1900 | 13th May 1900 | 20th May 1900 | 27th May 1900 | 3rd June 1900 | 10th June 1900 | 17th June 1900 | 24th June 1900 | 1st July 1900 | 8th July 1900 | 15th July 1900 | 22nd July 1900 | 29th July 1900 | 5th August 1900 | 12th August 1900 | 19th August 1900 | 26th August 1900 | 2nd September 1900 | 9th September 1900 | 16th September 1900 | 23rd September 1900 | 30th September 1900 | 7th October 1900 | 14th October 1900 | 21st October 1900 | 28th October 1900 | 4th November 1900 | 11th November 1900 | 18th November 1900 | 25th November 1900 | 2nd December 1900 | 9th December 1900 | 16th December 1900 | 23rd December 1900 | 30th December 1900 | 6th January 1901 | 13th January 1901 | 20th January 1901 | 27th January 1901 | 3rd February 1901 | 10th February 1901 | 17th February 1901 | 24th February 1901 | 3rd March 1901 | 10th March 1901 | 17th March 1901 | 24th March 1901 | 31st March 1901 | 7th April 1901 | 14th April 1901 | 21st April 1901 | 28th April 1901 | 5th May 1901 | 12th May 1901 | 19th May 1901 | 26th May 1901 | 2nd June 1901 | 9th June 1901 | 16th June 1901 | 23rd June 1901 | 30th June 1901 | 7th July 1901 | 14th July 1901 | 21st July 1901 | 28th July 1901 | 4th August 1901 | 11th August 1901 | 18th August 1901 | 25th August 1901 | 1st September 1901 | 8th September 1901 | 15th September 1901 | 22nd September 1901 | 29th September 1901 | 6th October 1901 | 13th October 1901 | 20th October 1901 | 27th October 1901 | 3rd November 1901 | 10th November 1901 | 17th November 1901 | 24th November 1901 | 1st December 1901 | 8th December 1901 | 15th December 1901 | 22nd December 1901 | 29th December 1901 | 5th January 1902 | 12th January 1902 | 19th January 1902 | 26th January 1902 | 2nd February 1902 | 9th February 1902 | 16th February 1902 | 23rd February 1902 | 2nd March 1902 | 9th March 1902 | 16th March 1902 | 23rd March 1902 | 30th March 1902 | 6th April 1902 | 13th April 1902 | 20th April 1902 | 27th April 1902 | 4th May 1902 | 11th May 1902 | 18th May 1902 | 25th May 1902 | 1st June 1902 | 8th June 1902 | 15th June 1902 | 22nd June 1902 | 29th June 1902 | 6th July 1902 | 13th July 1902 | 20th July 1902 | 27th July 1902 | 3rd August 1902 | 10th August 1902 | 17th August 1902 | 24th August 1902 | 31st August 1902 | 7th September 1902 | 14th September 1902 | 21st September 1902 | 28th September 1902 | 5th October 1902 | 12th October 1902 | 19th October 1902 | 26th October 1902 | 2nd November 1902 | 9th November 1902 | 16th November 1902 | 23rd November 1902 | 30th November 1902 | 7th December 1902 | 14th December 1902 | 21st December 1902 | 28th December 1902 | 4th January 1903 | 11th January 1903 | 18th January 1903 | 25th January 1903 | 1st February 1903 | 8th February 1903 | 15th February 1903 | 22nd February 1903 | 1st March 1903 | 8th March 1903 | 15th March 1903 | 22nd March 1903 | 29th March 1903 | 5th April 1903 | 12th April 1903 | 19th April 1903 | 26th April 1903 | 3rd May 1903 | 10th May 1903 | 17th May 1903 | 24th May 1903 | 31st May 1903 | 7th June 1903 | 14th June 1903 | 21st June 1903 | 28th June 1903 | 5th July 1903 | 12th July 1903 | 19th July 1903 | 26th July 1903 | 2nd August 1903 | 9th August 1903 | 16th August 1903 | 23rd August 1903 | 30th August 1903 | 6th September 1903 | 13th September 1903 | 20th September 1903 | 27th September 1903 | 4th October 1903 | 11th October 1903 | 18th October 1903 | 25th October 1903 | 1st November 1903 | 8th November 1903 | 15th November 1903</ |
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Table No. V.
Showing the effect of Evacuation on the Epidemic in the Hoshiarpur District.

| A. | B. | C. | D. | E. | F. | | | | | | | | | | | | | | | | | | | | G. | H. | I. | J. |
|------------|------------------|---|--------------------------------|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------------------|---|-----------------------------------|--|
| | NAME OF VILLAGE. | Probable date of outbreak (i.e., 1st case). | Date of evacuation of village. | Total number of cases before evacuation. | Columns showing the number of attacks day by day for the first twenty days after evacuation. | | | | | | | | | | | | | | | | | | | | Total of last 20 columns. | Total number of cases which occurred after the twentieth day of evacuation. | Total number of cases up to date. | REMARKS. |
| Serial No. | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | | |
| 1 | Birampur | 5th Novr. 1897 | 26th Decr. 1897 | 24 | 1 | 2 | 1 | ... | 2 | ... | ... | ... | 1 | 1 | 2 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 13 | 12 | 49 | Thirteen cases occurred during the first 20 days, but it cannot be ascertained on which days they occurred. |
| 2 | Purkhowal | 27th Janv. 1898 | 3rd Feby. 1898 | 8 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 13 | 2 | 23 | Seven of these cases occurred really before the evacuation of the village during the month of April, but they were not shown in the report till the 7th June 1898. |
| 3 | Rampur-Biron | 31st Janv. | 6th May | 28 | 6 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 10 | 10 | 43 | These 6 cases which should have been previously entered were omitted by mistake. |
| 4 | Simul Mazara | 28th Janv. | 5th March | 8 | ... | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 34 | 9 | 51 | |
| 5 | Dheron | 27th Janv. | 20th Feby. | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 6 | Bhajjal | 6th Feby. | 24th Feby. | 10 | 4 | 3 | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 7 | Sadhowal | Unknown | 6th March | 45 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 8 | Hajipur | 6th March 1898 | 2nd April | 10 | 8 | 12 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 9 | Parowal | 18th " | 24th March | 94 | 13 | 13 | 10 | 8 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 10 | Garchankar | 23rd " | 2nd May | 16 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 11 | Sauwahi | Unknown | 5th April | 17 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 12 | Kelloval | " | 30th " | ... | On 1st and 2nd days | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 13 | Garhi | " | 30th " | 19 | 56 | 13 | 5 | 8 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 14 | Chinkoi | 21st April 1898 | 1st May | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 15 | Bhagwain | 12th May | 20th " | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 16 | Palewal | Not stated | 13th June | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| | Total | | | 288 | 95 | 45 | 38 | 31 | 34 | 24 | 18 | 8 | 4 | 12 | 10 | 5 | 3 | 2 | 5 | 2 | 7 | 4 | 3 | 2 | 365 | 60 | 703 | |

Table No. VI.

Table showing the period which elapsed between the date of the total evacuation of the Village and the date of the last case of Plague.

| JULLANDER DISTRICT. | | | | | HOSHIAHPUR DISTRICT. | | |
|---------------------|------------------|----------------------------------|-----|------------|----------------------|----------------------------------|----------|
| Serial No. | Name of village. | Last case. | | Serial No. | Name of village. | Last case. | |
| | | Number of days after evacuation. | ... | | | Number of days after evacuation. | Remarks. |
| 1 | Khatkar Kalan | 36 | ... | 51 | Sirhal Mandi | 24 | ... |
| 2 | Jhaudher Khurd | 37 | ... | 52 | Dhaukhua | 22 | ... |
| 3 | Khanbhana | 53 | ... | 53 | Mokandpur | None. | ... |
| 4 | Khatkar Khurd | 12 | ... | 54 | Gobindpur | 18 | ... |
| 5 | Shikohpur | 31 | ... | 55 | Lehl | 25 | ... |
| 6 | Sirhal Qazian | 34 | ... | 56 | Chak Kalat | 20 | ... |
| 7 | Mallupota | 31 | ... | 57 | Panian | 11 | ... |
| 8 | Gunschaar | 27 | ... | 58 | Kariba | 31 | ... |
| 9 | Jhaudher Khurd | None. | ... | 59 | Piragpur | 10 | ... |
| 10 | Sahlon | 27 | ... | 60 | Rasulpur | 8 | ... |
| 11 | Mehlgahla | 47 | ... | 61 | Rehpa | 17 | ... |
| 12 | Kaman | 25 | ... | 62 | Gosal | 10 | ... |
| 13 | Jagatpur | 34 | ... | 63 | Bhangal | 11 | ... |
| 14 | Khatkar Khurd | 19 | ... | 64 | Bajon | 8 | ... |
| 15 | Katharon | 37 | ... | 65 | Mallah | 4 | ... |
| 16 | Karnana | Not evacuated. | ... | 66 | Anja | 5 | ... |
| 17 | Balon | 29 | ... | 67 | Chhokran | 12 | ... |
| 18 | Lakhpur | 12 | ... | 68 | Laroya | 16 | ... |
| 19 | Nurpur | 37 | ... | 69 | Pharala | 31 | ... |
| 20 | Lodhipur | 34 | ... | 70 | Ladhana Jhika | 2 | ... |
| 21 | Sah Kalan | 11 | ... | 71 | Bhaura | 2 | ... |
| 22 | Mahrampur | 46 | ... | 72 | Taran | 2 | ... |
| 23 | Naura | None. | ... | 73 | Jhingar | 8 | ... |
| 24 | Masani | 38 | ... | 74 | Bahrwal | None. | ... |
| 25 | Banga | 51 | ... | 75 | Aur | 1 | ... |

NOTE.—Average in the Jullander District ... 21 days.
Hoshiahpur " " " 26 "

It will be seen from these figures that the longest period which it took to eradicate the disease was fifty-four days in the case of Sirhal Qazian in the Jullundur District, and fifty-two days in the case of Garbshankar in the Hoshiarpur District. But, on the other hand, in several instances, no new cases occurred after evacuation. The average time for the disease to stop was twenty-one days in the Jullundur District and twenty-six days in the Hoshiarpur District. It is impossible to suppose that this quick termination of the epidemic, after evacuation, was due to any other cause except the beneficial ones directly due to the evacuation. If any further proof were required, it would be found in the fact that, as the weather got warmer and the people huddled less together in the camps, the effects of the evacuation became more and more marked. Thus in December, January and February it took thirty-seven, fifty-three, twelve, thirty-one, fifty-four and thirty-one days to eradicate the disease from each of the 6 villages, while in June and July of the 11 new villages treated, with the exception of Pharala, which gave an unexpected case thirty days after evacuation, no village produced cases after sixteen days.

The villages of Sirhal Qazian, Mallupota and Gunachaur were got out into camps during the inclement cold and damp weather of February when the conditions of camp life were unfavourable to stopping the disease. The effect was marked on the returns as shown in the table.

In connection with these evacuations, we ought to mention the "primary" disinfection of the camps, as on it also depends part of the success of the operations. It was always carried out in the segregation camps, and in certain villages in which the disease did not stop quickly after evacuation such as Khankhanan, Shikohpur and Mehlgabla, it did so immediately we disinfected all the camps. If this disinfection be looked upon as one of the necessary details of the evacuation and, if it were carried out systematically in all the camps and not in a few, as has been done in most of our villages, then, there is little doubt that, we should greatly diminish the time it would take to eradicate the disease. Instead of the average being over twenty-two days after evacuation, it would probably be under twenty days.

On looking into the figures before us, one is very inclined to compare the number of cases occurring in the village before evacuation with the numbers attacked after evacuation. But, for several reasons, this is not a very useful comparison. In the first place, it is almost impossible to get information about all the cases which have occurred in the village previous to our arriving. In fact, months afterwards information concerning cases and deaths previously quite unsuspected by us have been brought to light. While it is practically certain that we got hold of all the cases occurring in the camps after the evacuation, as well as many cases attacked in the village, but not found till they were in camp. The consequence is that the figures after evacuation would tend to be larger than those before evacuation. Then again, in many of our villages, we were able to get hold of the first person attacked while he was still ill, and to evacuate the *mohulla* or the village as circumstances permitted. In these cases the epidemic practically began after the people got into camp. Here again, the figures after evacuation would be larger than those before the operation. It is due to these facts that the figures in both the districts under consideration are larger for the first twenty days after evacuation than during the whole period before evacuation. They probably indicate that we had got the epidemic at its height, or while still increasing in most of our villages. But the fall is so considerable after this first period in camp that the figures are worth quoting. Thus, in Jullundur, we have records of 1,099 cases occurring in 75 villages before evacuation. But during the interval, from the 20th day in camp up to the end of the epidemic, there were only 262 cases in the same villages. In like manner the figures fell from 288 to 50 in the Hoshiarpur District.

If we consider villages in which the disease had existed some time, or where a large number of cases (say over 50) had occurred before evacuation we find the following results :—

Long standing epidemics.

Disinfection of camps hastens the end of the epidemic.

Comparing the number of cases, before and after evacuation, is not a fair test.

TABLE No. VII.

| Village. | Before evacuation. | For the whole period after evacuation. | Remarks. |
|----------------------|--------------------|--|--|
| Khatkar Kalan | 68 | 11 | |
| Khaakhana | 115 | 60 | In this case there was a recrudescence due to the disinfecting villagers being attacked. |
| Gunachaur | 92 | 55 | |
| Banga | 81 | 22 | |
| Kariha | 126 | 69 | Including 35 cases entered on fourth day after evacuation which were old cases. Nearly all the cases occurred within the first five days after evacuation. |
| Garshankar | 94 | 63 | |

To this list may be added Shikohpur, which is stated to have had at least 30 deaths beyond the 23 cases, of which we have records. Thus the attacks before evacuation were 53, after 52.

To these instances, the argument might be put forward that we got the disease at a stage when the epidemic was naturally beginning to abate. This is always a hard assertion to refute. But it cannot be brought against the 56 villages in which evacuation was carried out before 10 cases had been attacked in the village. In these cases in which the epidemic could only be said to be beginning the disease in almost every instance was quickly banished from the locality.

It is therefore fairly well established that, in evacuation of villages, we have a method of quickly and certainly stamping out plague. In not a single village in the areas under consideration can it be said to have failed. It was successful in every season of the year, though it took longer in the winter than in the summer. It was equally successful in large villages of from 3,000 to 6,000 people as in little hamlets.

Evacuation of villages successful at all times of the year and in large villages.

Partial Evacuation.

The question which now naturally arises is, whether partial evacuation would not have been quite as effectual as total evacuation of the villages. It would certainly have been cheaper, and given less trouble to all concerned. The method was attempted in the following instances:—

Ten villages in which partial evacuation was tried.

- I. *Mehlgabla* (No. 11).—The first case was an "imported" one; it was found early,—the day after attack. Only one house was evacuated on the 23rd February, and subsequently disinfected. But the disease spread, and the whole village had to go into camp on March 17th.
- II. *Karnana* (Nos. 16 and 45).—The man attacked lived really in Kamam, but had his shop in Karnana where he was attacked. He was removed to Kamam hospital and his house locked up and subsequently disinfected; but the disease spread to the adjoining houses, and the whole village had to be evacuated on 6th April.
- III. *Naura* (No. 23).—Only one case occurred in this village. Three houses were evacuated, and no further cases occurred.
- IV. *Masani* (No. 24).—Only one case was found on March 10th. Two families living in one courtyard were put into camp. Their houses were disinfected. But the disease spread, and the whole village was evacuated on the 29th of the same month.
- V. *Banga* (No. 25).—The system of evacuation by *mohultas* was given a long trial. Even removing 200 people for one case did not check the spread. For details see *Banga*, page 30.
- VI. *Haphowal* (No. 27).—One case discovered on March 12th. It had only just been attacked. The family was segregated and the house disinfected. But the disease spread, and the whole village had to be turned out on the 29th of the same month.

VII. *Aur* (Nos. 47 and 75).—In this case a partial evacuation on April 7th seemed successful. But the village had eventually to be evacuated in July on account of 4 cases which were found at that time.

VIII. *Mokandpur* (No. 53).—Partial evacuation of an outlying portion of the village was attempted on 15th April. But the disease spread and the whole village had to go out into camp on the 11th of the following month, after which the epidemic stopped.

IX. *Gobindpur* (No. 54).—Only the infected *mohulla* was evacuated, but failed to stop the epidemic. The whole village went out into camp ten days later.

X. *Rampur Bilron* (No. 3—H).—Partial evacuation was attempted in January and was apparently successful. But the village was re-infected in April, and the disease spread rapidly, and the place had eventually to be entirely evacuated and disinfected.

Thus it appears that in 10 villages in which partial evacuation was attempted it only entirely succeeded in one case—*Naura*. There was partial success in two cases—*Aur* and *Rampur Bilron*. But these villages got re-infected, and had eventually to be evacuated, while it will be remembered that in the case of the villages of *Jhandher Khurd*, *Khatkar Khurd* and *Bahrwal*, which were re-infected after complete disinfection, the disease did not show any tendency to spread, and partial evacuation was then successful.

Partial evacuation entirely failed in 7 villages, and only entirely successful in one case.

It is therefore our strong opinion that, as far as villages are concerned, partial evacuation is only feasible when we have simply one family to deal with, and that only in the hot weather. If more than one family be attacked the whole village should be evacuated with the utmost celerity. The only exceptions being made are villages in which disinfection has lately been carried out, when the partial evacuation usually succeeds.

In Section III it will be seen that Dr. Clark (page 153) does not agree with us in this matter. He believes that partial evacuation could be more extensively resorted to, and instances the methods adopted in England to check small-pox. In answer to this, we may state that his experience of plague was gained in the hot weather, when the disease showed little tendency to spread, and when therefore the conditions for checking the spread were more favourable than at other times of the year. Besides, small-pox, as far as we know, is not spread by rats, while plague is eminently so. It is probably this fact which has made partial evacuation fail, not only with us, but in other parts of India where it has been tried. The diseased people are removed, but the diseased rats are left behind to spread the infection to the neighbouring houses.

INSPECTING STAFF.

When plague was first discovered in the Jullundur District, Dr. Nicholson was deputed to travel about in the Nawashahr and Banga division of the district and Dr. Datta in the adjoining portion of the Hoshiarpur District, and to carefully examine every village with a view to getting early information about the disease. By this means several plague infected villages were discovered. Dr. Davidson relieved Dr. Nicholson in December, but otherwise there was no change in the staff. When, on February 1st, Shikohpur was discovered and it was found that the inhabitants had been able to hide the existence of the disease for at least a month, if not two months, and had probably already communicated the disease to other villages, it was felt that something more must be done to ensure early information. It was of vital importance that we should get news directly the disease appeared in any new village. Colonel Massy, the Commissioner, instituted a system of rewards to persons giving the first reliable information, as well as insisting on the punishment of the headmen of villages where the occurrence of the disease was wilfully kept secret. The plan worked admirably. Before the people were very reticent, and even when giving information, often refused to give names and details; so that after getting to the village we were sometimes unable to find the cases.

Inspecting officers.

Rewards and punishments.

Afterwards, zaildars, lambardars, police, chaukidars,—in fact everybody—showed an eager desire to obtain the fifty rupees reward which was offered for reliable information concerning every new village. This desire was intensified by the prosecution and imprisonment of some lambardars who had hidden cases of plague in their villages. Arguments have been brought forward against the reward system, and it is affirmed that it would cause the “native gentry” to stand aloof from us, instead of trying to help us; and also that it would cause ill-feeling among the various villages which gave information. We never found that the first ever happened. In fact, the “native gentry,” such as we had in the district, showed quite as much keenness to get the reward as the poor chaukidar, and in at least two cases did not scruple to appropriate the money which should have gone to the poorer official. That the system would cause ill-feeling, we think most probable. But any form of information given against the will of those who have an interest in hiding it, causes ill-feeling. It is certainly better that this should take place than that the disease should exist, as it did in Shikohpur, and cause a mortality the amount of which we have up to this day never accurately gauged. Besides, the villagers seem quite capable of settling disputes of this kind among themselves, and as a matter of fact, we had no trouble on this score. In March, a further development of the “Inspecting Staff” took place. The eastern portion of the Jullundur District and the southern portion of the Hoshiarpur district were each divided into circles as follows:—

Jullundur—Phagwara, Banga, Nawashahr, Rahon and Aur.

Hoshiarpur—Garhshankar, Saiba, Malpur and Balachor.

Each had a European officer in charge, and one or more naib-tahsildars, hospital assistants, kanungos and patwaris. They were made responsible for a given defined area, and weekly inspections were made of every village in their *ilaga*. Carefully prepared nominal rolls were made of every village and kept by the patwari. When the inspecting officer came round, the whole village was paraded in front of him, and the hospital assistant examined the pulse and tongue of each person. In the case of purdah-women, European nurses and *dhais* were used. The system seemed perfect on paper, and indeed gave excellent results. But there were one or two small defects in it. There were very few medical officers on this work, and the detection and diagnosis of single isolated cases of plague is often very difficult. Very few of the hospital assistants placed on this work had ever seen a case of plague before they came on duty. The consequence was that the executive staff were often unnecessarily troubled. In one case the inspecting officer reported plague in three new villages. Police cordons were immediately got ready, huts and carts were ordered and one of the plague medical officers, who was already very hard worked, had to go off to make arrangements. On arriving at each village in turn he found the cases reported were not plague. We should, therefore, advise, if in future we have again to carry out inspection work and medical officers are not available, that the hospital assistants placed on this duty be men who have had practical experience of the disease. The young and new hands could be put on to executive work, such as hospital duties till they had mastered the rudiments of the diagnosis of plague.

Another fact which was prominently brought forward in several instances was the ease with which cases could be hidden in the village even when that village was being thoroughly inspected. In the case of Punnian we ourselves attended the roll-call and inspected the people. Yet a woman actually down with the disease was never discovered, as her sister, from another village, personated her at the muster. Sotran was inspected one evening by the inspecting staff and no illness found; yet two cases of plague were found the following morning which must have existed over night. In Haphowal the whole village was turned out in the morning without avail, but four cases were found by the executive staff on the same afternoon. All this tends to show that merely turning out the people and reading out their names is not sufficient to detect the disease. We must have the co-operation of the headmen of the village, and the only way of getting this is by paying for it, or punishing heavily

those who oppose us. Dr. Walton's views on this matter do not entirely agree with ours. But as he has done inspection work and knows the difficulties to be contended with, his opinion we consider most valuable, and his notes on the subject are given in full on page 164, Section IV of this report. Dr. Clark's views on this matter are given on page 155. It will be seen that he practically agrees with us. We do not, however, believe that plague cases would often or even ever be imported for the sake of the reward. The people are much too afraid of the disease to allow this. They fear the disease everywhere, and if we do not get early information, it is because they fear our treatment more than the disease. This, in most cases, we were able to satisfy ourselves, was due to false reports as to our methods and to the natural superstition of the natives.

POLICE CORDONS.

This is not purely a medical question. But from the fact that the cordons were the chief measure used to prevent the spread of the disease they require to be considered from the medical side. It will be remembered that in every locality where we found plague we immediately placed a cordon of police round the boundary of the fields belonging to the village. This prevented communication with the outside world, while it allowed the zemindars to carry on their ordinary agricultural pursuits. As more than three-quarters of the people with whom we had to deal earned their livelihood by the tilling of the soil, very little hardship was experienced, and, as other things were favourable in the spring, the people thus imprisoned were able to reap an exceptionally good harvest. Besides this outside cordon, there was another inner one placed close round the village to guard all its entrances, and thus keep the people who were out in camp from entering the village where infection lingered till the disinfection of the houses had been completed. As already stated, this cordon had often to be dispensed with for want of sufficient men. In these cases we nearly always got people infected from going into the village and the disease in consequence took longer to stamp out. This cordon, if constituted, was removed when the people returned to the village. The outer cordon was not removed till the village was declared free, that is ten days later; after the people had been under observation for this period in their homes. In May and June, the cordon was sometimes removed six days after the return of the village, the village not being finally inspected and declared free till the tenth day.

There cannot be any doubt in any one's mind that the cordons were most essential. They prevented the very large emigration from village to village which the fear of the disease naturally engenders, and were, therefore, very material in checking its spread, which has been shown to be chiefly caused by human agency. We have therefore placed our chief reliance on the efficiency of these police sentries placed all round the various infected areas.

On looking back on the history of the spread of the epidemic (see first section of this report), we find that there is a record of human agency in the case of 67 villages, and on further analyzing these cases we find that in 45* cases the people carrying the infection must have broken through the cordon. Thus had our cordons been perfect we should have had 45 fewer villages to deal with, and as these were the means of infecting other villages, it is not saying much to affirm that our work would have been, at least, halved had our cordons been absolutely reliable.

In what way did the cordons fail, and how was it that people were able to pass through our living barrier? There are two possible sources of failure. One is, that our cordons may have been too weak, the other that possibly the police sentries were open to corruption, as all low paid native officials in India are liable to be. That the first was one of the causes is pretty evident, when we remember that eight sentries to the mile was the strongest cordon employed, and sometimes they were much less. Such a

* In the cases of Garhi, Sirbal Mandi and Malpur the medium of transference of the disease is unknown though the infection took place after the village giving the disease had been cordoned.

cordon would be inefficient to stop people in broad daylight especially if there were any crops lying between them. But they must have been practically useless when nightfall arrived. It is true that at the height of the epidemic there were no more police available; but, long before this time, our cordons were weak, and hence the increase in the number of our villages affected.

As to the second suggestion that the police may have allowed people to pass on receipt of some illegal gratification, which was frequently hinted at, we have no definite grounds to go upon.

In fact, to our mind the weakness of the cordon is sufficient to account for the inefficiency to stop communications. But, if the authorities think that the other suggestion was a possible source of weakness, it might be possible to substitute a military for a constabulary cordon. The former are under more strict discipline, and, as they have a much larger proportion of European officers, are more closely supervised.

A suggestion worth considering, if again next cold weather we are unfortunate enough to have a recurrence of the epidemic, would be to have a double cordon. Thus it might be possible to have a police cordon just inside the village boundary, and a hundred yards outside this a military cordon. In this way there would be a double barrier and a certain amount of rivalry between the two sections. Any person coming from within even if he happen to pass the police cordon, would be pretty certainly stopped by the outer military cordon, and *vice versa* in the case of people trying to get in from outside. This plan would only be practicable if we had to deal with a few villages. In suggesting this plan one has in mind the case of Astrakan, which some years ago suffered from an extremely virulent form of plague. The Russian authorities did little or nothing to stamp out the epidemic. They certainly sent four doctors to treat cases. But three of these succumbed to the disease. But those in charge of the operations spent all their time and energy in making an efficient cordon. Military only were employed, and these were all armed with shot. They made three cordons in three circles—one outside the other—and these were so effectual that the disease never spread; but, after devastating the locality, died out.

It is not necessary to go to this extreme to get an efficient cordon. On service, it is usually possible to have a sufficient number of sentries placed round a camp extending for miles to keep out the enemy. Surely, it is possible for us to have enough men placed round a village area to keep in an enemy far more terrible than any foreign foe. It seems to us to be only a question of the number and efficiency of men available.

When we remember that it is man or man and his clothes which carries infection from one locality to another, in at least 93 per cent. of the cases recorded, it behoves us to pay every attention to our cordons, which are the only means we have for preventing persons moving from place to place.

In the case of the remaining 7 per cent. in which the disease may be carried by rats. These will never carry it very far: possibly to the next village a mile away. But we can easily deal with these localized areas.

Passes.

Intimately connected with the question of cordons comes the question of passes. Great care has to be exercised in the supervising, granting and checking the egress and ingress of officials connected with the plague operations.

The method adopted during the cold weather was that each of the European officers in charge of the various sections—civil, police and medical—was able to write passes for those working under him. These passes were collected by the police at the head-quarters of each cordon and sent in daily to the Assistant Commissioner in charge of the plague operations of the circle, who scrutinised them and referred them to the officers concerned, when any doubt existed as to their genuineness or regularity. The

plan, we believe, acted admirably, and the only improvement necessary was that the forms might have been printed on various coloured cards to indicate whether they were temporary or permanent passes, or only passes to allow certain persons to pass some particular cordon, such as people being allowed to go to the general quarantine camp, or stores being carried in carts along the main road from Phagwara to the plague officers, or police camps. This was attempted and eventually carried out in May. But the order which accompanied it, that all passes must be signed by the Assistant Commissioner in charge, almost nullified their efficiency. He was pestered for passes morning, noon and night, and had to give something like a hundred a day. It was impossible for him to investigate each case, and the interruption to his ordinary work must have been considerable. The old plan of allowing each European Officer to be responsible for the passes issued to his subordinates was therefore reverted to and answered admirably. There is no instance, in the present epidemic of the disease having been transmitted by any abuse of passes or even by officials. But, it appears, that the disease was introduced into Garhshankar from Birampur, by persons pretending to be cartmen bringing hut-making materials and lime across the cordon.

The orders concerning cordons and passes were as follows:—

Cordon Rules issued by Major Inglis, May 2nd, 1898.

1. The Assistant Commissioner in charge of each group of villages (at present the groups are the Banga, Nawashahr, and Garhshankar groups) is responsible for ordering a cordon to be put on or taken off a village, and no other officer is to give directions in this respect.

2. The police officer posted to each group, on receiving instructions from the Assistant Commissioner, will at once proceed to obey them, first obtaining detailed instructions from the Assistant Commissioner on all necessary points, especially in the case of cordoning a village as to whether the whole village area or only some portion of it is to be cordoned.

3. The police officer in charge of the whole police in the plague area is requested to issue detailed instructions as to duties of his assistants, of the inspectors, deputy inspectors and sergeants in respect to this cordon duty, laying down especially the periods within which the cordons are to be inspected by each officer or sergeant.

4. No one but European officers will be allowed to pass the cordon without a written pass.

5. Passes will be of three kinds—

- (1). Permanent,
- (2). Temporary,
- (3). To go into quarantine camp,

and no pass of any kind can be given by any official other than the Assistant Commissioner in charge of a group of villages.

6. Permanent passes may be given only to tahsildars, naib-tahsildars and assistant surgeons whose duties must take them continually in and out of the cordon.

Temporary passes may be given to officials of all other ranks whose duties take them across the cordon and returned by the police to the Assistant Commissioner who issued them.

Passes to go into quarantine camp at Bahram may be given to every one wishing to go into quarantine. The police will arrange to escort these persons from the cordon line to the quarantine camp.

A list of all temporary and quarantine passes must be sent by the Assistant Commissioner issuing the passes to Major Inglis on special duty at Phagwara the evening of the day of issue.

Passes to leave the quarantine camps can only be given by the medical commissioned officer in charge of the camp and must state that the bearer has been under observation for ten days and is free from infection.

7. Supplies, stores, &c., can only be brought into the cordon by being transhipped at places appointed for this purpose. The Assistant Commissioner in charge of groups of villages will arrange for this and report to Major Inglis the places fixed on. The fewer number of these transshipping stations, the better.

REVISED RULES FOR PASSES.

Copy of a letter No. 643, dated 19th May 1898, from Major E. Inglis, Deputy Commissioner on Special Duty, Phagwara, to the Assistant Commissioner, Banga.

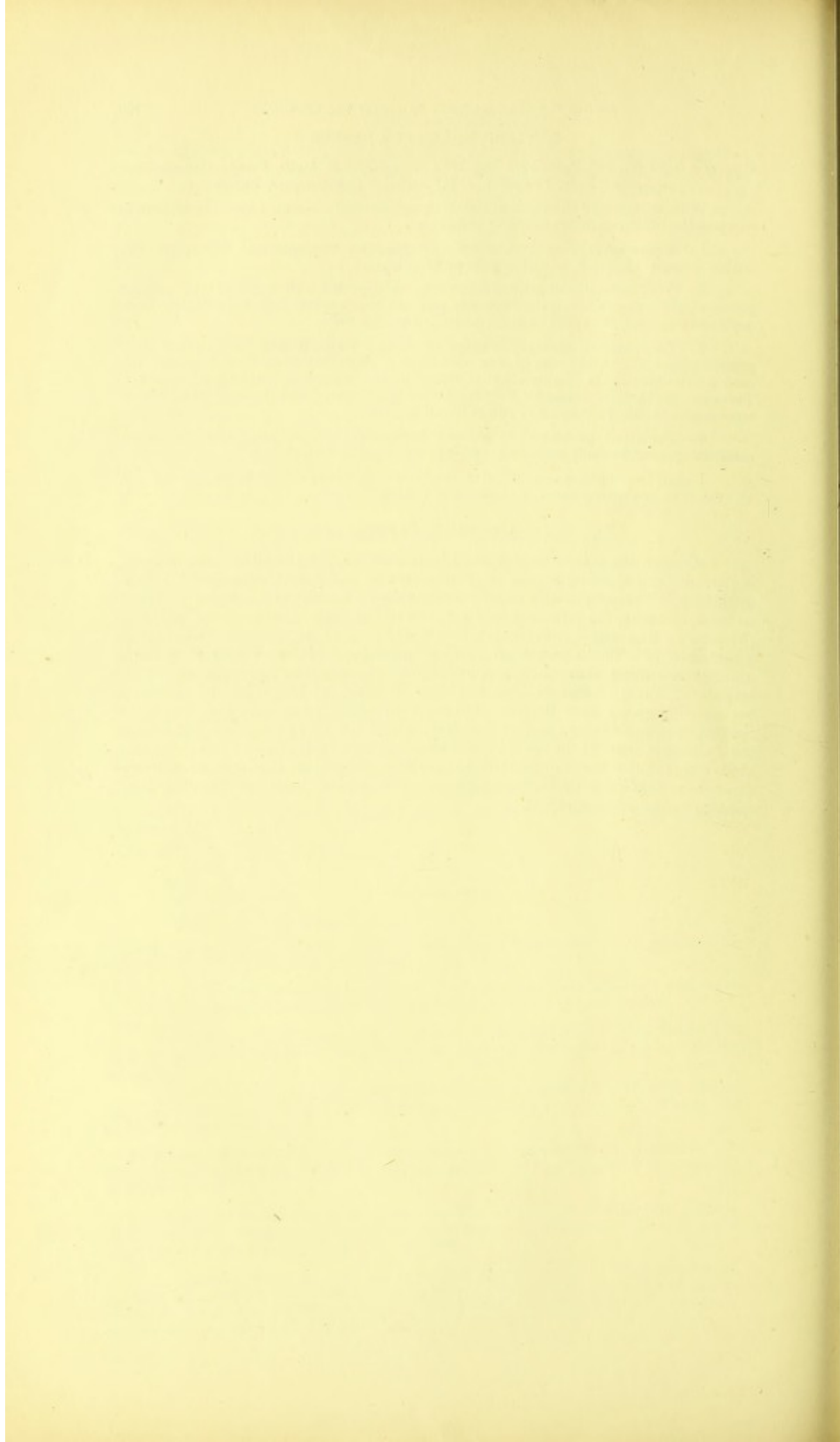
With reference to the Cordon Rules issued on 2nd instant, I have the honour to sanction the following rules regarding passes:—

1. A permanent pass granted by one Assistant Commissioner will enable the holder to cross the cordon line of any group of villages.
2. Civil, medical and police officers may be provided with some of the printed passes which in cases of necessity they can give to persons whom they have during their day's work to send on urgent business across the cordon line.
3. The hospital assistants in charge of village hospitals may be provided with printed passes which they can give to messengers whom they have to send across the cordon line either to the head-quarters of their group or elsewhere on urgent messages. These passes should be marked "Hospital Assistants' Passes," and the hospital assistants must report to you the number of passes issued by them.
4. The list of passes sent to me may be discontinued, but the lists of passes to enter the quarantine camp must be sent to the medical officer in charge.

I shall be obliged if you will give the necessary orders to the police and will let all officers in your group know of these revised rules.

Quarantine Camps.

Quarantine camps were formed from time to time to allow persons leaving the district to undergo ten days' observation and a final disinfection before departing. The people who usually underwent this were (1) officials ordered to fresh districts, (2) prisoners being taken to the head-quarters or to jail, and (3) persons who would suffer heavy loss if not present in some other locality by a certain date. These people on leaving were provided with special medical certificates stating that they had undergone the necessary precautions. The largest of these camps was formed near Bahram, a village nearly half-way between Phagwara and Banga. Railway observation posts were also formed at the Sutlej near Ludhiana and at the Beas, which are the two rivers which bound the Jullundur District on the west and east. These posts were of the ordinary kind which have been organized in various places on the line of railway throughout India during the past eighteen months and need no detailed description in the present report.



NOTES ON THE PROPHYLACTIC INOCULATION AGAINST PLAGUE IN
THE JULLUNDUR AND HOSHIARPUR DISTRICTS, 1897-98.

PROPHYLACTIC INOCULATIONS.

Before commencing the account of the inoculations in the Jullundur District, a word as to the nature of the prophylactic is necessary. It is usually spoken of as the "Prophylactic serum"; but it is not a serum in the true sense of the word. Serum is the watery portion of blood, while the material supplied is *bouillon* or broth prepared, filtered and sterilized in a special way. In this are grown plague bacilli until the solution becomes sufficiently impregnated with the cultivation. The bacilli are then killed by being kept at a temperature of 140° F. for a given period. The fluid is then placed in suitable bottles and hermetically sealed. The phials received by us have usually had the capacity of about 4 oz. and have contained about 3 oz. of the fluid. Smaller phials have lately been sent; but they are not so handy as the larger ones, as they necessitate the delay in opening a larger number of bottles when many inoculations have to be done. The medium, when it reaches us is a light brown slightly turbid fluid. It is the *bouillon*, containing the dead bacilli with their toxins which is inoculated under the skin. It is very favourable for the growth of many kinds of bacteria besides plague, and consequently special precautions have to be taken to prevent the germs of putrefaction, &c., getting into it during manufacture and at the time of using it, when the results would be disastrous if inoculated into persons. The details of the process of inoculation have already been given in a former report.

There is no objection to using the general term "serum" as long as it is clearly understood that the preparation is not made from the blood of animals as all true serums are. A better term would be the anti-plague prophylactic medium, and this, we believe, is the term Professor Haffkine himself uses.

From 2 to 3 c. c. of the medium of standard strength is the dose recommended by Professor Haffkine for an adult and proportionally smaller doses for children. The serum received here has been of half strength and sometimes even weaker. Consequently double or treble doses have been given. In the accompanying tables the actual doses are not named, but are corrected to the standard dose for the sake of uniformity and to allow of comparisons being made. The actual amount of fluid inoculated is immaterial, while the amount of toxin used is the important point. In all cases, where the inoculations have been successfully carried out the patient has had fever varying from 100° to 103° F. which passes off in a couple of days. There is usually swelling and pain at the seat of puncture which often lasts several days and may last over a week. Headache and a feeling of general malaise is common. In a large number of cases there was drowsiness which lasted one or two days. This symptom we have not seen mentioned elsewhere. But it is so marked in some cases that we cannot believe it has passed unnoticed. In no case have we seen any permanent discomfort arise from the inoculations, though a slight hardening, at the place of insertion of the fluid, often remains for several months.

The severity of the symptoms are proportionate to the dose given. If no symptoms arise after the first inoculation, the dose should be increased for the second, while severe symptoms after one inoculation are indications for reducing the dose in the second operation. It is a matter of regret that only a small proportion of those inoculated come again for the second dose which is usually given from eight to ten days later, but which can be given at any later period.

The operations have been carried out by Surgeons-Captain Wilkinson, Buist and James, and Dr. Fattah Chand in the Jullundur District and by Surgeons-Captain Clark, Hunter and Heard in the Hoshiarpur District.

When plague was discovered in the Jullundur District in October last, one of the first things done was to wire to Professor Haffkine for 1,000 doses of his prophylactic injections. In the course of a fortnight 200 doses arrived with a note stating that more would be sent if required.

In the meantime, the inhabitants of Khatkar Kalan, the village where the disease existed, had been got out into camp, and the disease had diminished to such an extent that it was felt that even if inoculations were carried out, very little opportunity would present itself for testing the efficacy of the new prophylactic. However, between November 5th and 8th, 209 people in the largest camp, called the Jhandaji Camp, and containing altogether 600 people, were inoculated. With the exception of one man who had fever at the time of his inoculation and took to his bed the following morning no cases occurred in this camp after the inoculations. The case mentioned was a very mild one and for some time it was difficult to decide whether it was plague or not. As the man must have been infected before the inoculation took place and was ill when inoculated, he is not included in the statistics given later on.

We unfortunately had a better opportunity in the case of Banga town. This place is situated on the high road half-way between Phagwara and Nawashahr. It contains 4,917 people (actual census taken in March last), and as it is the central market place for all the villages in this part of the Jullundur District, it was felt that if plague increased it was pretty sure to get into Banga. In fact, a little village called Khatkar Khard, only half a mile from the town, had already got attacked. It was therefore decided not to wait for actual cases, but to start prophylactic inoculations. Accordingly more prophylactic medium was indented for, and March 11th was fixed for the first day of inoculations. Curiously enough, the first case of plague was discovered on the same day. Only eight people presented themselves; but one of them was the zaildar of Banga, and another the President of the Municipal Committee. No uneasiness was, therefore, felt as to the possibility of inducing people to come forward. It was, however, thought advisable to wait a day after the first day of inoculations, in order to allow the rest of the people to see the effect of the treatment on those first inoculated. On the 13th, 24 people came up for treatment, and after this date whenever we had spare time we went into Banga and did inoculations. But as new plague villages were springing up on all sides it was often difficult to get time to do all who wished to be done. In spite of this 2,408 people have been inoculated in this district, over 1,000 inoculations have been done in Banga town, but only 865 people actually lived in the town.

Table VIII gives the details according to villages, castes and sex. It will be seen that the largest number of people were done in Banga town and the villages of Dasanjh* and Thandian. But in the two villages no plague occurred, and we have therefore not been able to draw any deductions from the inoculations done in them.

The actual villages in which the operations were performed were Khatkar Kalan, Banga, Katt, Chak Bilga, Thandian, Dasanjh, Pharala, Raipur, Punian and Ganachaur. The inhabitants of the other villages named in the table came chiefly to Banga for inoculation. It will be noticed that 134 people came from Karnana and were inoculated at Banga. Among them was a woman named Khemi, the wife of Ram Singh, a Hindu Rajput; she was forty years old and in good health. A dose of 2 cubic centimetres of the half strength prophylactic, which corresponds to 1 c. c. of the standard strength, was administered to her on April 5th; she went home, and subsequent enquiries showed that she had no fever, pain or redness in the site of inoculation following the operation. In fact she showed none of the signs of reaction which usually follow a successful insertion of the prophylactic. The dose was an extremely small one, and was purposely made so with the object of inducing more women from the village to come up for treatment. It was intended to give her a second dose at a later date, but she did not come again, and must, therefore, be looked on as a person insufficiently protected. A case of plague had been discovered at Karnana on March 2nd; but as it was proved to be an imported one, only a few houses were evacuated. However, on April 6th, the disease was found in an epidemic form and the village was accordingly cordoned and entirely evacuated; 42 cases of plague occurred in this village with 24 deaths, among a population of 1,357 people. The only one of the

* This is not the Dasanjh Kalan, where plague cases have lately been found.

Table
List showing Sex and Caste of People

| Serial No. | VILLAGES. | Sex. | | | HINDUS. | | | | | | | | | | |
|--------------|----------------------|-----------------------------|-------------------------------|--------|----------------------|-------|------------------------------|-----------|-------|----------|-----------|---------|----------|--------|--|
| | | Number of males inoculated. | Number of females inoculated. | Total. | Brahmins and Kuntia. | Jats. | Tarkhan, Lohar and Chhimbas. | Jhinwars. | Nais. | Kumhars. | Acharajs. | Fagirs. | Rajputs. | Total. | |
| 1 | Dhaban | 12 | ... | 12 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 2 | Katt | 30 | ... | 30 | ... | ... | 1 | ... | ... | ... | ... | ... | ... | 1 | |
| 3 | Chak Bilga | 67 | 2 | 69 | 9 | 35 | 21 | 1 | 2 | ... | ... | ... | ... | 68 | |
| 4 | Nurpur | 12 | ... | 12 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 5 | Sirhal Qazian | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 6 | Khatkar Kalan | 127 | 82 | 209 | 41 | 120 | 35 | 1 | 2 | 3 | ... | 5 | ... | 207 | |
| 7 | Banga | 688 | 177 | 865 | 546 | 64 | 82 | 21 | 13 | 3 | ... | 4 | 25 | 758 | |
| | | 4 | 1 | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 8 | Gobindpur | 2 | ... | 2 | ... | 2 | ... | ... | ... | ... | ... | ... | ... | 2 | |
| 9 | Thandian | 220 | 24 | 244 | 23 | 134 | 13 | 5 | 1 | 1 | ... | ... | ... | 177 | |
| 10 | Pharala | 88 | ... | 88 | 1 | 2 | 1 | 1 | ... | 3 | ... | 2 | ... | 10 | |
| 11 | Dasanjh | 209 | 163 | 372 | 12 | 192 | 61 | 10 | 7 | 16 | ... | 3 | ... | 301 | |
| 12 | Karnana | 118 | 16 | 134 | 16 | 10 | 12 | 7 | ... | ... | ... | ... | 89 | 134 | |
| 13 | Raipur | 56 | 4 | 60 | 2 | 25 | 19 | 4 | ... | ... | ... | ... | ... | 50 | |
| 14 | Bhokery... .. | 38 | 4 | 42 | 6 | 26 | 5 | ... | 1 | ... | ... | ... | ... | 38 | |
| 15 | Bika | 1 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 16 | Chimah | 1 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 17 | Khatkar... .. | 6 | ... | 6 | ... | 6 | ... | ... | ... | ... | ... | ... | ... | 6 | |
| 18 | Mukandpur | 2 | ... | 2 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | 2 | |
| 19 | Chhokran | 10 | ... | 10 | 9 | ... | ... | 1 | ... | ... | ... | ... | ... | 10 | |
| 20 | Panian | 68 | 22 | 90 | 10 | 58 | 16 | 1 | 3 | ... | ... | ... | 1 | 89 | |
| 21 | Mungowal | 1 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 22 | B. Mazari | 4 | 14 | 18 | 2 | 13 | ... | ... | ... | ... | ... | 1 | ... | 16 | |
| 23 | Herian | 3 | ... | 3 | 2 | 1 | ... | ... | ... | ... | ... | ... | ... | 3 | |
| 24 | Rasulpur | 3 | ... | 3 | 1 | ... | 2 | ... | ... | ... | ... | ... | ... | 3 | |
| 25 | Jhingar | 2 | ... | 2 | ... | 1 | 1 | ... | ... | ... | ... | ... | ... | 2 | |
| 26 | Jadlah | 2 | ... | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 27 | Jindwal | 1 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 28 | Heon | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 1 | |
| 29 | Hamirowal | 2 | ... | 2 | ... | ... | 2 | ... | ... | ... | ... | ... | ... | 2 | |
| 30 | Salab | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 31 | Nawashahr | 3 | ... | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 32 | Jullander | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 33 | Nagara | 1 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 34 | Dabwal | 2 | ... | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 35 | B. Mazara | 39 | ... | 39 | 3 | 27 | 9 | ... | ... | ... | ... | ... | ... | 39 | |
| 36 | J. Ladhana | 2 | ... | 2 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | |
| 37 | Bahrwal | 6 | ... | 6 | ... | 6 | ... | ... | ... | ... | ... | ... | ... | 6 | |
| 38 | Bans | 2 | ... | 2 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | 2 | |
| 39 | Kajhai | 2 | ... | 2 | ... | 1 | ... | 1 | ... | ... | ... | ... | ... | 2 | |
| 40 | Gunachaur | 61 | ... | 61 | 8 | ... | ... | ... | 2 | 2 | ... | ... | ... | 12 | |
| Total | | 1,892 | 516 | 2,408 | 695 | 729 | 280 | 53 | 31 | 28 | ... | 16 | 115 | 1,947 | |

inoculated people attacked was Khemi, who succumbed to the disease. She was attacked on 15th April and died on the 21st. We now know that dropping cases were occurring in Karnaba between March 2nd when the first case occurred and April 7th when the village was evacuated. It may have been the knowledge of this which induced the people to go all the way to Banga to be inoculated.

On the whole, the experience in this village is in favour of the inoculations. Out of 1,357 people 42 were attacked, making a percentage of 3.094 of the population attacked. From among the 134 persons inoculated only one was attacked, making a percentage of .74. The one case attacked had an extremely small dose, in fact so small that no reaction followed the operation. The people of the village themselves were the first to notice this fact, as nearly all the others operated on had suffered severely, and they consequently readily gave the information about the absence of reaction in this woman. Of course the experience of one village by itself is not any proof of efficacy. These figures are too small for definite deductions, and the results may be due to other causes.

To return to Banga.

Details of inoculations at Banga.

In this town the inoculations were carried on on a larger scale, and consequently the results are of more value.

The conditions were these: on the day the first inoculations were done, the first *mohulla*, containing 87 people, was evacuated. On subsequent dates more cases were discovered, and more people were turned out in the following manner:—

March 28th, 203 people were placed in camp.

| | | | |
|------------|-----|---|---|
| April 7th, | 249 | " | " |
| " 16th, | 64 | " | " |
| " 18th, | 56 | " | " |
| " 19th, | 56 | " | " |
| " 20th, | 28 | " | " |
| " 23rd, | 28 | " | " |
| " 25th, | 14 | " | " |

April 27th the commencement of the evacuation of the whole town took place. This was completed on the 29th. Besides this about 150 people left the village and went into camp of their own accord in the various *baghs* round the town before the 27th. Up to the 29th there had been 70 cases with 36 deaths in Banga.

While the *mohulla* system was being carried out, each time a section of the town was evacuated a small cessation in the cases took place. The disease soon ceased to spread in the camps, but re-appeared in the town in portions still inhabited, but usually somewhere near the last *mohulla* evacuated. The general tendency of the disease was to increase. After the whole town was evacuated, plague soon stopped, and, not counting a hidden case found on June 26th and which had been ill several weeks when found, the last case occurred on May 17th, i.e., eighteen days after evacuation. Thirty-three cases and 29 deaths took place after the town came out.

Inoculations were performed between March 11th until the people came out into camp on April 30th.

Altogether, 103 cases of plague occurred with 65 deaths, making a percentage of 2.18 of the whole population attacked, with a mortality of 63 per cent. Taking the inoculated people, 865 in number, 6 were attacked with plague, all had the disease very mildly and none died, making a percentage of .693 attacked with a mortality of 0 per cent.

Still these figures are open to the objection that the people inoculated may have chiefly come from uninfected streets and *mohullas*, and therefore would naturally have a better percentage of escape from the disease. In order to prove that there is any good in the inoculations it is necessary to show that the people operated on were living in the same conditions as the

Table No. IX.

Table showing the number of persons inoculated and uninoculated in each of the houses attacked with Plague in Banga town.

| Serial No. of family. | INOCULATED PERSONS IN THE FAMILY. | | | | UNINOCULATED PERSONS IN THE FAMILY. | | | | REMARKS. |
|-----------------------|-----------------------------------|-------------------------------|-----------------------|--------|-------------------------------------|-------------------------------|-----------------------|--------|-------------------|
| | Un- attacked. | Attacked but recovered. | Attacked and died. | Total. | Un- attacked. | Attacked but recovered. | Attacked and died. | Total. | |
| 1 | 2 | 1 | ... | 3 | ... | ... | 2 | 2 | |
| 2 | 2 | ... | ... | 2 | 4 | ... | 4 | 8 | |
| 3 | 1 | ... | ... | 1 | ... | ... | 3 | 3 | |
| 4 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 5 | 2 | ... | ... | 2 | 1 | ... | 1 | 2 | |
| 6 | 5 | ... | ... | 5 | 6 | ... | 1 | 7 | |
| 7 | ... | ... | ... | ... | 3 | 1 | 1 | 5 | |
| 8 | 2 | 1 | ... | 3 | ... | ... | ... | ... | |
| 9 | 1 | ... | ... | 1 | 3 | 1 | 1 | 5 | |
| 10 | ... | ... | ... | ... | 1 | 1 | ... | 2 | |
| 11 | ... | 1 | ... | 1 | 1 | ... | 2 | 3 | |
| 12 | ... | 1 | ... | 1 | 2 | ... | 1 | 3 | |
| 13 | ... | ... | ... | ... | 1 | 1 | 1 | 3 | |
| 14 | 1 | ... | ... | 1 | 3 | 1 | ... | 4 | |
| 15 | ... | ... | ... | ... | 2 | 1 | ... | 3 | |
| 16 | 4 | 1 | ... | 5 | 3 | 1 | 1 | 5 | |
| 17 | 1 | 1 | ... | 2 | 1 | 1 | 1 | 3 | |
| 18 | ... | ... | ... | ... | 3 | 1 | ... | 4 | |
| 19 | ... | ... | ... | ... | 1 | 1 | 1 | 3 | |
| 20 | ... | ... | ... | ... | 1 | 1 | ... | 2 | |
| 21 | ... | ... | ... | ... | ... | 3 | 1 | 4 | |
| 22 | 3 | ... | ... | 3 | 2 | 1 | ... | 3 | |
| 23 | 2 | ... | ... | 2 | 2 | 1 | ... | 3 | |
| 24 | ... | ... | ... | ... | 1 | 1 | ... | 2 | |
| 25 | ... | ... | ... | ... | ... | ... | 2 | 2 | |
| 26 | ... | ... | ... | ... | 4 | 1 | ... | 5 | |
| 27 | 1 | ... | ... | 1 | 2 | 2 | ... | 4 | |
| 28 | ... | ... | ... | ... | 6 | 1 | ... | 7 | |
| 29 | ... | ... | ... | ... | ... | 1 | ... | 1 | |
| 30 | 6 | ... | ... | 6 | 1 | 1 | ... | 2 | |
| 31 | 3 | ... | ... | 3 | 3 | ... | 1 | 4 | |
| 32 | ... | ... | ... | ... | 1 | 1 | 3 | 5 | |
| 33 | 3 | ... | ... | 3 | 3 | ... | 1 | 4 | |
| 34 | 1 | ... | ... | 1 | 8 | 1 | 1 | 10 | |
| 35 | ... | ... | ... | ... | 5 | ... | ... | 5 | |
| 36 | ... | ... | ... | ... | ... | 1 | ... | 1 | |
| 37 | 1 | ... | ... | 1 | 1 | ... | 3 | 4 | |
| 38 | 1 | ... | ... | 1 | 1 | ... | 1 | 2 | |
| 39 | 2 | ... | ... | 2 | ... | 1 | 1 | 2 | |
| 40 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 41 | 1 | ... | ... | 1 | 9 | ... | 1 | 10 | |
| 42 | ... | ... | ... | ... | 7 | ... | 1 | 8 | |
| 43 | 1 | ... | ... | 1 | 4 | ... | ... | 4 | |
| 44 | 2 | ... | ... | 2 | 5 | ... | ... | 6 | |
| 45 | 1 | ... | ... | 1 | 4 | ... | ... | 4 | |
| 46 | 1 | ... | ... | 1 | 3 | ... | ... | 3 | |
| 47 | ... | ... | ... | ... | 2 | ... | 1 | 3 | |
| 48 | 1 | ... | ... | 1 | 1 | ... | 1 | 2 | |
| 49 | ... | ... | ... | ... | 6 | ... | 1 | 6 | |
| 50 | 1 | ... | ... | 1 | ... | ... | ... | ... | |
| 51 | ... | ... | ... | ... | 6 | ... | 1 | 7 | |
| 52 | ... | ... | ... | ... | 5 | ... | 1 | 6 | |
| 53 | ... | ... | ... | ... | 1 | ... | 1 | 2 | |
| 54 | ... | ... | ... | ... | 3 | ... | 2 | 5 | |
| 55 | ... | ... | ... | ... | 1 | ... | 1 | 2 | |
| 56 | ... | ... | ... | ... | 1 | ... | 1 | 2 | |
| 57 | 1 | ... | ... | 1 | ... | ... | 1 | 1 | |
| 58 | ... | ... | ... | ... | 3 | ... | 1 | 4 | |
| 59 | ... | ... | ... | ... | 5 | ... | 1 | 6 | |
| 60 | ... | ... | ... | ... | 2 | ... | 1 | 3 | |
| 61 | 2 | ... | ... | 2 | 7 | ... | 1 | 8 | |
| 62 | ... | ... | ... | ... | 7 | ... | ... | 7 | |
| 63 | 2 | ... | ... | 2 | 1 | 1 | 1 | 3 | |
| 64 | 1 | ... | ... | 1 | 1 | ... | ... | 1 | |
| 65 | 3 | ... | ... | 3 | 1 | ... | ... | 1 | |
| 66 | 6 | ... | ... | 6 | ... | ... | ... | ... | |
| 67 | 1 | ... | ... | 1 | 1 | ... | ... | 1 | |
| 68 | ... | ... | ... | ... | 2 | ... | 1 | 3 | |
| 69 | ... | ... | ... | ... | ... | 1 | ... | 1 | |
| 70 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 71 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 72 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 73 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 74 | ... | ... | ... | ... | 6 | 1 | ... | 7 | |
| 75 | ... | ... | ... | ... | 6 | 1 | ... | 7 | |
| 76 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 77 | ... | ... | ... | ... | ... | ... | 1 | 1 | |
| 78 | ... | ... | ... | ... | 3 | ... | 1 | 4 | |
| 79 | ... | ... | ... | ... | 1 | 1 | 1 | 3 | |
| 80 | ... | ... | ... | ... | 1 | ... | 1 | 2 | |
| 81 | ... | ... | ... | ... | 4 | ... | 1 | 6 | |
| Total | 68 | 6 | ... | 74 | 184 | 32 | 65 | 281 | Total in camp—365 |

people in whose houses plague occurred and were also liable to infection. In order to test this side of the question, we had a complete list made of the segregation and hospital camps at Banga. Here we had 81 families containing 355 souls, who had been placed in these camps because they had cases of plague in their families or because they ran some particular risk of getting the disease, either from the position of their houses or the nature of their work and connections with those already attacked. As a proof that the infection was severe, it may be noted that only 11 out of the 81 families escaped having some member attacked.

On making a separate list of those inoculated and those uninoculated (Table No. IX) and comparing the results, the following interesting figures were obtained:—

Seventy-four people, or a little over 20 per cent. of the two camps had been inoculated. Among these 6 were attacked with plague, but they all had the disease very mildly, and all recovered. Of the rest, that is to say, the uninoculated people 97 out of 281 were attacked, and of these 65 died. Comparing the results by percentages, we get the following figures:—

- (1) Inoculated 8.108 per cent. attacked, mortality 0 per cent.
- (2) Uninoculated 34.51 per cent. attacked, mortality 67 per cent.

In this instance the difference of the figures is very large, and as the inoculated people were living, and had lived throughout the epidemic, in exactly the same conditions as the uninoculated ones,—first in their houses and afterwards in the camps, and with the same sources and chances of infection, the difference appears to be due to something more than accident. In fact it points to the efficacy of the inoculations.

To draw the net still closer round the people who were unfortunate enough to contract the disease after submitting themselves to inoculation, we find the following results (See Table No. X).

In the houses picked out, 10 people were inoculated, of which 6 contracted the disease, while in the same houses there were 17 uninoculated persons, 9 of whom contracted the disease. This certainly does not compare well for inoculations. It shows that 60 per cent. of the inoculated were attacked, while only 52.9 per cent. of the uninoculated contracted the disease. But it must be borne in mind that the figures are very small, and that we are here making selections of houses, in that we are picking out only houses where inoculated people had contracted plague and that these people had very few relatives living with them, and also that when plague was discovered in any of their houses they were immediately evacuated, and consequently came under the beneficial influence of going out into camp, and that the disease was thus prevented from spreading to all the members of the household. When, however, we compare the mortality of the inoculated cases with the mortality of the uninoculated cases, occurring in the same houses, the difference is very marked. All the 6 protected cases recovered, while only one out of the 9 unprotected people recovered. The difference in the nature of the disease was also most marked in hospital among the inoculated persons. The symptoms set in in the usual way with sudden fever, headache, vomiting and early prostration, and the disease looked like an ordinary case of plague. But after a day or two the symptoms suddenly ceased, the temperature fell to normal, the mind cleared and the patient became convalescent much earlier than usual. The gland, in those people, in every case except one, re-absorbed without suppuration. Bishen Das, who had a large axillary bubo, was the worst case. He had 11 days' fever, Ganga Ram 8, Nathu 4, Ahmad Faruq, who had been inoculated twice, 3, Lachman Das 2, and Pala only 1 day's fever.

The doses of prophylactic given to these persons were—

| | Age in years. | | Number of days' fever. |
|--------------------|---------------|-----------------------------------|------------------------|
| Bishen Das | 12 | 1½ c. c. of the standard strength | 11 |
| Lachman Das | 14 | c. c. " " " | 2 |
| Pala | 35 | c. c. " " " | 1 |
| Ahmad Faruq... .. | 12 | 1½ c. c. in two doses | 3 |
| Ganga Ram | 22 | 1½ c. c. " " " | 8 |
| Nathu Ram | 19 | 2 c. c. " " " | 4 |

Table No. X.

A full list of all the occurrences of Plague in houses inhabited by persons inoculated against the Plague in Banga Town.

| Full address. | Names, sexes and ages of the inoculated persons who were living in the house on the date of attack, with the dates of their inoculation. | Names, sexes, and ages of the uninoculated persons who were living in the same house on the date of attack. |
|--|---|---|
| | Name, sex, and age of the attacked, if he is amongst the inoculated; date of onset of disease, symptoms, issue. | Name, sex, and age of the attacked, if he is amongst the uninoculated; date of onset of disease, symptoms, issue. |
| 1. Banga, Chabutra ka mohulla. The household consisting of five persons was moved out into camp on March 29th, 1898. (No. 1 in Table No. IX). | <i>Unattacked</i> .—Nathu, son of Ralla Ram, M., <i>et.</i> 25 years, Brahmin. Inoculated on March 20th with 1½ c. c. standard strength (Reg. No. 364), nursed Surtu during his illness, escaped. <i>Attacked</i> .—Surtu (called Bishen Das), son of Ralla Ram, M., <i>et.</i> 12 years. Inoculated on March 25th with 1½ c. c. standard strength (Reg. No. 618), attacked with plague 10 p. m., March 31st (six days after inoculation), gland in left axilla. Delirium. Mild attack. Discharged April 20th (twenty days illness). | <i>Unattacked</i> .—1. Rama, son of Ralla, M., <i>et.</i> 20 years, Brahmin. This man was inoculated after coming out into camp. <i>Attacked</i> .—1. Ralla, son of Khema, M., <i>et.</i> 53 years, Brahmin. Attacked at noon, March 31st. Died April 1st, 3 p. m., severe fever, delirium, no glands. 2. Dukam Dai, wife of Ralla, F., <i>et.</i> 40 years, Brahmin, attacked at 6 p. m., April 1st, died April 6th. High fever, collapse, gland left inguinal. |
| 2. Banga, Mohulla Chabutra. (No. 8 in Table No. IX). | <i>Unattacked</i> .—Birja, son of Nihal Chand, M., <i>et.</i> 38 years, Brahmin. Inoculated with 2½ c. c. on April 14th (Reg. No. 842) standard. 2. Mamon, wife of Eidu, F., <i>et.</i> 40 years, Muhammadan. Inoculated with 2 c. c. on April 14th (Reg. No. 855) standard. <i>Attacked</i> .—1. Lachman Das, son of Birja Mal, M., <i>et.</i> 14 years, Brahmin. Inoculated with 2 c. c. on March 20th (Reg. No. 385), attacked on April 21st (after one month); mild attack. Gland left inguinal. Discharged May 21st (one month's illness). | Nil. |
| 3. Banga. This water-carrier lived by himself in the town; but with a family (No. 6, Table No. IX) in camp. | <i>Unattacked</i> .—Nil. <i>Attacked</i> .—1. Pala, son of Chhajju, M., <i>et.</i> 35 years, Jhinwar. Inoculated on April 16th with 2½ c. c. (standard), Reg. No. 916, attacked on April 24th (eight days after inoculation), an extremely mild attack. Gland in left inguinal region. Discharged on May 10th (sixteen days in hospital). | Nil. |
| 4. Banga, Nauwa Bazar. (No. 11, Table No. IX). | <i>Unattacked</i> .—Nil. <i>Attacked</i> .—Ahmad Foruk, son of Imam Din, Kashmiri, <i>et.</i> 12 years. Inoculated twice— March 22nd 1 c. c. standard Reg. No. 401, March 25th 1½ c. c. Reg. No. 401, Attacked on April 25th (one month after last inoculation), very mild attack, gland right femoral. Discharged 23rd June (twenty-eight days in hospital). | <i>Unattacked</i> .—Nur Muhammad, son of Ramzan, M., <i>et.</i> 20 years, Kashmiri. <i>Attacked</i> .—Nur Bibi, wife of Ramzan, F., <i>et.</i> years, Kashmiri, attacked April 23rd and died April 29th, 1898. 2. Ramzan, son of Samander, M., <i>et.</i> 60 years, attacked April 23rd. Died June 3rd, 1898. |
| 5. Banga, Chimba Mohulla. This man corresponds to No. 12 in Table No. IX. He had a separate hut in camp, but lived in the same house as No. 54 in the town. | <i>Unattacked</i> .—Nil. <i>Attacked</i> .—1. Ganga Ram, son of Labha, M., <i>et.</i> 22 years, Chimba. Inoculated on March 20th, with 1½ c. c. standard (Reg. No. 361), attacked April 25th (thirty-five days after inoculation), mild case, gland in right inguinal region. Discharged May 25th (ill one month). | <i>Unattacked</i> .—1. Punan, wife of Ganga Ram, F., <i>et.</i> 22 years, Chimba. 2. Gulab Dai, wife of Ditta, F., <i>et.</i> 10 years, Chimba. 3. Thakur, son of Radha, M., <i>et.</i> 27 years, Chimba. 4. Nikka, son of Jeon, M., <i>et.</i> 27 years, Chimba. 5. Mahan, wife of Thakur, F., <i>et.</i> 10 years, Chimba. <i>Attacked</i> .—1. Dia Banti, daughter of Ganga Ram, F., <i>et.</i> 2 years; attacked on April 28th. Died on May 5th. 2. Radha, son of Nikka, M., <i>et.</i> 45 years; attacked April 22nd. Died April 28th. 3. Naraini, wife of Radha, F., <i>et.</i> 40 years; attacked April 27th. Died May 3rd. |
| 6. Banga. Family attacked in Segregation Camp. (No. 17 in Table No. IX). | <i>Unattacked</i> .—Ghasita Ram, son of Sain Das, M., Brahmin Acharaj <i>et.</i> 25 years. Inoculated March 22nd with 2 c. c. standard (Reg. No. 456). <i>Attacked</i> .—1. Nathu Ram, son of Urjan Das, M., Brahmin Acharaj, <i>et.</i> 19 years. Inoculated 24th March with 2 c. c. standard (Reg. No. 573). Attacked May 3rd (forty days after inoculation) and was discharged June 6th (thirty-five days in hospital) mild attack, glands right inguinal. | <i>Unattacked</i> .—Pala Ram, son of Gobind Ram, M., <i>et.</i> 48 years, Acharaj. <i>Attacked</i> .—1. Matab Kaur, wife of Urjan Das, F., <i>et.</i> 60 years, Acharaj. Attacked. Died May 1st. 2. Jatto, wife of Sain Das, F., <i>et.</i> 40 years, Acharaj. Attacked May 13th. Recovered June 6th. |

The only other case of plague among inoculated persons occurred at Pharala in a coolie on disinfecting work. There were 99 men on this work. They had all been inoculated and only this man was attacked. He had the disease in a mild form and recovered rapidly. He seems to have been infected while on work in the village. He lived with his two daughters in a hut in camp. They had not been inoculated. But, as the man was removed immediately on getting ill to hospital and the hut changed, it is not surprising that neither of the girls got affected.

To sum up, there have been 2,408 people inoculated, 193 people were inoculated twice. There have been 8 cases of plague among the inoculated, with one death. In the fatal case, the dose was a small one, and no re-action followed the operation.

Below will be seen Surgeon-Captain Clark's report on the inoculations performed in the Hoshiarpur District. He and Surgeon-Captain Hunter performed 1,510 operations among infected villages, and had no cases of plague among those inoculated. The results obtained, like those in the Jullundur District, though not by any means conclusive, are so far encouraging that they favour the continuation of the experiment in future epidemics. It is only when the prophylactic has been tried in a large number of cases, all over the country and under varying conditions that a definite decision as to its efficacy in protecting against plague will be arrived at. It will never be the sole remedy against the progress of the malady, but it may possibly become one of the chief measures. Small-pox is not nearly so infectious as this disease, and yet we have a more perfect protective serum to combat it, namely vaccine lymph. This remedy has now been tried for a hundred years and tried on a very extensive scale. It has considerably diminished the amount of small-pox in existence, but it has not banished it. In the same way, it is impossible to believe that any form of protective inoculation can ever be effective if used as the only means of preventing infection. It is extremely difficult to inoculate large communities, and a few will always escape, and these few have the power of keeping the disease in existence, ready to break out again when favourable conditions arise. If, on the other hand, we look upon the inoculations as one, but only one, of the excellent sanitary measures which Science has given us to combat this malady, then there is every hope of its becoming a powerful weapon in our hands.

Prophylactic inoculations are only one of the measures against plague.

NOTES ON CASES INOCULATED AT GARHSHANKAR BY SURGEON-
CAPTAIN R. CLARK, I.M.S.

No cases of plague have occurred among inoculated persons, although they have, in the majority of instances, been exposed to infection. Thus almost all of the 708 males inoculated in Garhshankar, 64 males inoculated at Garhi, 49 of the males in Palewal, 9 males inoculated at Bilron, 68 males at Bagwain and 66 at Ibrabimpur were employed at the disinfection of houses. In Palewal all the people who went into segregation camp, numbering 43, were inoculated. No cases occurred amongst them after the evacuation of the village. In Bagwain, where the segregation camp was not inoculated, 6 cases occurred after evacuation, but of these 5 were infected in the village. One, however, was acquired in the segregation camp. Individual instances might be quoted in several instances of the uninoculated members of an inoculated family being picked out by the disease. Thus in Garhshankar the last case which has occurred was in an uninoculated disinfecting coolie, who worked in the same gang with his brother at the same work, and was apparently subject to exactly the same conditions as his brother who was inoculated. The former got plague and died, his brother who accompanied him to hospital and nursed him till he died remains well. In Bilron the case of 26th May was an exactly similar one. This man objected to being inoculated, but was a worker in the disinfecting gang. His brother was in the same gang, had worked on the same houses, was inoculated and did not suffer from the disease, nor did his wife who was inoculated and came into hospital to attend on him. The last case which has occurred at Palewal has an interesting history. It was that of an old woman whose grandson, an inoculated man, lived with her. She was almost bed-ridden and had not left the courtyard for months, but she was in the habit of sending her grandson daily over to the house of Nathu Baid, in which the first case occurred, to ask after the health of the sick members of his family. The grandson escaped, but the old woman, who was uninoculated, took the disease and died. Facts like these of course prove nothing, but they are interesting and ought I think to encourage us to give a more extended trial to inoculation. In the 1,500 cases which have been inoculated by us here we have had no case in which any serious consequences followed from inoculation. One old man who was inoculated had a temperature of 105° on the evening of the second day and fell very ill. His pulse became weak, and for a time I was somewhat anxious about him as he was a *hakim* who had offered himself as one of the first cases for inoculation in Garhshankar; but, with rest in bed and nursing, he speedily recovered, and within a week was as well as ever. In the majority of the other inoculation cases the temperature did not go above 102° and the patients were as well as ever 48 hours after inoculation, although the local reaction caused them some trouble for about five days longer. In 5 cases, after inoculation, severe urticaria occurred. This appeared in all the cases within two hours after the operation and disappeared within 24 hours. The urticaria was similar to that which occurs after inoculation with the diphtheria anti-toxin, and no treatment was given for it beyond a mild purgative. In one case after inoculation a small abscess appeared at the side of the operation. It was opened, dressed antiseptically and healed up in a few days. I have no other notes of general interest with regard to the cases we inoculated here.

Table No. XI.
Showing the Sex and Caste of the People inoculated in the Garhshankar Tahsil.

| Serial No. | Name of village. | Total number inoculated. | Sex. | | | Hindu. | Muhamm.-an. | Others. |
|------------|--------------------------|--------------------------|-------|---------|--------|--------|-------------|---------|
| | | | Male. | Female. | Child. | | | |
| 1 | Hajipur ... | 33 | 20 | 12 | 1 | ... | ... | 33 |
| 2 | Parowal ... | 26 | 21 | 4 | 1 | 9 | 6 | 11 |
| 3 | Sadhowal ... | 26 | 24 | ... | 2 | ... | 10 | 16 |
| 4 | Sauwali ... | 18 | 17 | 1 | ... | ... | 4 | 14 |
| 5 | Garhshankar ... | 801 | 708 | 90 | 3 | 85 | 659 | 57 |
| 6 | Garhi ... | 81 | 64 | 13 | 4 | 40 | 11 | 30 |
| 7 | Palowal ... | 280 | 218 | 62 | ... | 212 | 2 | 66 |
| 8 | Bilron ... | 49 | 9 | 32 | 8 | 1 | 1 | 47 |
| 9 | Bagwain ... | 100 | 68 | 23 | 9 | 64 | 5 | 31 |
| 10 | Ibrahimpur ... | 94 | 66 | 25 | 3 | 64 | 1 | 29 |
| | European or Eurasian ... | 2 | ... | 2 | ... | ... | ... | 2 |
| | Total | 1,510 | 1,215 | 264 | 31 | 475 | 699 | 336 |

(Sd.) CLARK,
Surgeon-Captain, I. M. S.,

Garhshankar, }
The 10th July 1898.
Note by Surgeon-Captain James.—It should be mentioned that the prophylactic inoculations were commenced in the Garhshankar Tahsil by Surgeon-Captain Heard on 1st April 1898, at the village of Parowal, and carried on by Dr. Clark on May 5th at Garhshankar itself. Among these, there were eight attacked with plague, all in the Jullundur District, and only one died, and that a woman who was proved to have had an insufficient dose of the prophylactic. The result of the inoculations, as a whole, is therefore most encouraging.

Plague Medical Officer.

SECTION III.

THE CHARACTER OF THE DISEASE, TREATMENT, &c.

The character of the plague, as experienced in the Punjab during the past few months, is very like that seen in other parts of the country. There were the usual symptoms of sudden onset, high fever, vomiting with the early appearance of enlarged glands in one or other of the ordinary situations, the rapid development of delirium or the apathetic semi-comatous condition so characteristic of the malady. A few cases, every now and then, gave difficulty in diagnosis. But, usually, it was difficult to mistake the disease, especially as malarial fever, the disease with which it would most frequently be mistaken in the early stages, was conspicuously absent from the district during the time plague was prevalent. We have little to add to the signs and symptoms described last year in the Plague Report as seen by us in Bombay, Karachi and Sukkur. The disease was identical in most of its characters. But a few statistics of cases which we were able to collect this year are of interest as testing the accuracy of some of the statements made previously.

Incubation.—It is notoriously difficult to fix the incubation period of various diseases. We can seldom be sure that the infection took place at any particular moment or hour, and, even if it did, it is difficult to be sure that there were not any other causes of infection acting at some other time. But the following instances are instructive.

The best example we have to give is that of Chak Kalal. Here the people had been out in camp ten days, and there had been no attacks of plague in the village or camp up to the 15th April. On this date the people returned to the village for one hour, while a storm was impending. Numerous rats dead of plague were found. It is therefore pretty certain these people were infected at this time, about 10 a.m. Symptoms of plague developed in those attacked on the following days as here shown—

| After | 1 day | none. |
|-------|--------|--------|
| " | 2 days | ... 3. |
| " | 3 " | ... 7. |
| " | 4 " | ... 7. |
| " | 5 " | ... 1. |
| " | 6 " | ... 2. |
| " | 7 " | ... 2. |
| " | 8 " | ... 0. |
| " | 9 " | ... 3. |
| " | 10 " | ... 2. |
| " | 11 " | ... 2. |

After which the disease stopped. It will be seen that the great majority of the people were attacked between the 2nd and 5th days.

Again, if we look at tables Nos. IV and V, pages 118—20, we find that nearly all the cases of attacks took place within the first eleven days after evacuation in both the districts within this period. When they were attacked at a later period there was nearly always either suspicion or actual proof that they had obtained their infection at some later date.

It is therefore pretty certain that the incubation period of plague is between two to eleven days. In the case of workmen attacked during the disinfection of the village we found the incubation period from two to five days. It would naturally vary according to the mode of inoculation, of which, we regret to say, we have not sufficient facts before us to be able to make any general statements.

TABLE No. XII.

The position of the buboes in 3,128 cases is given in the following table:—

| | NECK. | | AXILLA. | | GROIN. | | MORE THAN ONE SITUATION. | | OTHER SITUATIONS. | | NO GLANDS INCLUDING PNEUMONIC CASES. | | TOTAL. | |
|--|--------|------------|---------|------------|--------|------------|--------------------------|------------|-------------------|------------|--------------------------------------|------------|--------|------------|
| | Fatal. | Recovered. | Fatal. | Recovered. | Fatal. | Recovered. | Fatal. | Recovered. | Fatal. | Recovered. | Fatal. | Recovered. | Fatal. | Recovered. |
| Jullunder | 163 | 98 | 175 | 100 | 784 | 617 | 67 | 47 | 26 | 16 | 296 | 110 | 1,511 | 982 |
| Hoshiarpur | 49 | 30 | 43 | 25 | 173 | 161 | 19 | 6 | 10 | 6 | 70 | 44 | 363 | 272 |
| Total | 212 | 128 | 218 | 125 | 957 | 778 | 86 | 53 | 36 | 16 | 366 | 154 | 1,874 | 1,254 |
| Total number of cases under each head. | 340 | | 343 | | 1,735 | | 139 | | 52 | | 520 | | 3,128 | |
| Percentage of deaths under each head. | 62.35 | | 63.27 | | 55.46 | | 61.86 | | 69.23 | | 70.04 | | 59.91 | |

From these figures it will be seen that cases of plague which do not develop buboes are the most fatal forms. They include primary pneumonic cases, which are almost invariably fatal.

Contrary to the usually accepted opinion, buboes in the axilla were found to be slightly more fatal than cervical buboes.

When the glands enlarged in the groin the cases were more hopeful, and the mortality was only 55 per cent. As there are two sets of glands in this situation the following distinction should be made:—

Inguinal: fatal cases 540, non-fatal 408, total 948. Femoral: fatal cases 244, non-fatal 209, total 453. Of these the inguinal gave a mortality of 55.67 per cent., and femoral 53.80 per cent.

As to the relative frequency of these cases—

| | |
|-------|--|
| 10.87 | per cent. of the cases had the buboes in the neck |
| 10.97 | " " " " " " axilla |
| 37.45 | " " " " " " inguinal |
| 15.98 | " " " " " " femoral |
| 4.44 | " " " " " " more than one situation |
| 1.66 | " " " " " " other situations than neck, axilla or groin. |
| 16.63 | " " " " " " no buboes |

Notes were also taken to determine what was the usual time which elapsed between the onset of the disease and the appearance of the buboes. It was found in 47 cases, in which the notes stated the time, that in 4 cases the glands appeared within an hour after the initial symptoms, in 5 cases in two hours, in 8 cases in three hours, in 12 cases in four hours, in 1 case in five hours, in 7 cases in six hours, in 2 cases in eight hours, in 1 case in ten hours, in 2 cases in twelve hours, in 1 case in 24 hours, in 1 case in one and half days, in 1 case in two days, in 1 case in three days, and in 1 case in four days.

These numbers are too small for any very elaborate deductions. But they show that the majority of cases of plague develop buboes within six hours of the beginning of the attack; but the appearance of the enlarged glands may be delayed several days.

Mortality.—With regard to the mortality from this disease it may be stated roughly that, in the epidemic, two out of every three persons attacked died. The actual figures were:—Total number of cases 3,469, of whom 2,176,

or a percentage of 62·73, died. The mortality varied in the three circles, and was as follows :—

TABLE No. XIII.

| | | | | | | Cases. | Deaths. | Percentage of deaths to cases. |
|--------------|-----|-----|-----|-----|-----|--------|---------|--------------------------------|
| Banga Circle | ... | ... | ... | ... | ... | 1,710 | 1,048 | 61·21 |
| Nawashahr | ... | ... | ... | ... | ... | 996 | 660 | 66·27 |
| Garhsbankar | ... | ... | ... | ... | ... | 763 | 468 | 61·34 |

It may be noted in passing that the mortality was smallest in the districts where the people came willingly for treatment. It should also be mentioned that the deaths include persons who died in their houses and therefore had no treatment. The hospital results would in most cases be better than the above record.

The following table is interesting in showing on what "day of the disease" the mortality was highest :—

TABLE No. XIV.

| MORTALITY, FROM DAY TO DAY, OF THE DISEASE IN THE JULLUNDER DISTRICT. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------------|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|-----|----|-----|----|-------------------------|
| Total deaths. | Day of disease. | | | | | | | | | | | | | | | | | | | | | | | | | | Date of attack unknown. |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | |
| 1,708 | 207 | 266 | 221 | 209 | 136 | 139 | 107 | 54 | 31 | 21 | 17 | 5 | 7 | 2 | 2 | 4 | 2 | 4 | 1 | ... | 3 | 1 | ... | 3 | ... | 1 | 261 |

It will be noticed that 14·30 per cent., or nearly one-seventh of the cases died within 24 hours of the attack ; 18·38 per cent., or nearly one-fifth, died in the next 24 hours ; 15·27, or one-sixth, on the 3rd day ; 14·44, or about one-seventh, on the 4th day ; 9·40, or about one-eleventh, on the 5th day. The figures were nearly the same on the 6th day. After this there is a great drop in the mortality. In fact 62 per cent. of the cases, or roughly two-thirds of the patients, died within four days of the commencement of the attack. If the patient lived a week (8 days) his chances of recovery were very great, as only 7·47 per cent. of the cases died after this date.

In no case did a person suffer from a second attack of plague.

The disease does not seem to be more fatal in one class than another. The sturdy Sikh died as easily as the weakly Brahmin ; but stout people seem to bear the brunt of the malady especially badly. The corpulent *baniyas*, whose habits are entirely sedentary, are particularly bad subjects. At the present moment we cannot recall to mind a single instance of one of these recovering. The disease spares neither young nor old, the "infant mewling and puking in the nurse's arms," and he in "second childishness and mere oblivion" are equally prone. The male as much as the female. Nor is there any caste which can boast of immunity. Surely the dread Muse has few agents more effective than this in cutting the silver thread of life. Cholera is more potent and perhaps quicker in destroying life, but its sojourn among us in any particular locality is much shorter : while the *matta* (small-pox), which is looked upon by the natives as the personified fiend of destruction, is left far behind.

Complications and Sequelæ.—These were surprisingly few. Acute pneumonia was perhaps the commonest. There was diarrhœa in some cases instead of constipation. Hæmorrhages were few. Ophthalmia, followed by complete destruction of the eye, was seen in one or two cases. The commonest sequela was aphasia which lasted some time. In two cases under the writer's notice the power of speech has not yet completely returned. There were two cases of paraplegia. Acute mania during the disease in one case was followed by melancholia, but the patient, a young woman, ultimately recovered.

Post mortems.—No *post mortems* were performed. This was chiefly due to the fact that the community we were working among were very adverse to any of their members being subjected to any form of examination which entailed opening the body. But we frequently obtained permission to open glands after death for the purposes of bacteriological examination, and the plague bacillus was obtained and cultivated on artificial media frequently enough to satisfy the purposes for which the investigations were made.

It is to be regretted that none of us had any time for laboratory or investigation work. The time of "a plague medical officer" is far too much occupied for leisure for scientific research.

TREATMENT.

The plague cases were treated in hospital wherever possible. Those who refused European treatment were allowed to be treated by their own Hakims, or to treat themselves. But all cases of plague and their families were segregated in camps away from other healthy communities.

On admission to hospital the patients had a phenyle bath, or if too ill for this, were sponged down with warm phenyle lotion. Blankets were then given them and their own beds, washed down also with phenyle lotion, allowed them if they preferred it; otherwise string charpoys were provided for them at Government expense. Clothes were also kept in readiness. But in most cases they preferred to wear no clothes while the fever lasted, but used to wrap themselves up in their blankets.

In most cases, food was provided at Government expense, and milk formed an important item of diet, a seer of which was allowed per head for the cases in the acute stages of the illness, and was diminished as convalescence set in. If vomiting was persistent soup, either vegetable or made from goat's meat, was substituted. A thin soup called *picch* which was recommended by Dr. Fattah Chand, and was simply the water from boiled rice, was often found most useful. The usual diet consisted of:—

Sago or rice, 2 chittaks, and sugar, 1 chittak. These were given boiled with water, and milk afterwards added. They were much appreciated if properly cooked.

Convalescent diet:—

Ata, $\frac{1}{2}$ to 1 seer.

Ghee $\frac{1}{4}$ chittak.

Salt, $\frac{1}{4}$ „

Dhannia, *mirch* and *haldi*, of each $\frac{1}{8}$ chittak.

In a few cases meat was also ordered.

The great secret in the treatment was keeping the patients constantly lying down. This was often difficult to accomplish, especially at night, when delirious patients were always at their worst, and sometimes attempted to leave the hospital altogether. Stimulants were freely administered in the form of country rum. But in order to prevent waste the spirit was added to the plague mixture.

Various drugs were tried. But the following prescription seems to have been most generally used, *viz.* :—

| | | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|-----|------|
| Re—Liq. Hydrarg Perchloride | ... | ... | ... | ... | ... | ... | 3j |
| Liq. Strychniæ | ... | ... | ... | ... | ... | ... | ℥iii |
| Tinct. Digitalis | ... | ... | ... | ... | ... | ... | ℥✓ |
| Rum | ... | ... | ... | ... | ... | ... | 3ii |
| Aq. Ad. | ... | ... | ... | ... | ... | ... | 3i |

This was labelled "the Plague Mixture," and was given every four to six hours.

In a few cases great benefit was obtained by hypodermic injections of rum; 20-30m were injected with an equal quantity of Liq. Hydrarg Perchlor. There was always a temporary improvement, even in those cases where the patient eventually died, and in several instances where the case seemed hopeless, the patient ultimately recovered after several of these injections, especially in cases which refused all food. It will thus be seen that we had no specific against the disease. But there is no doubt that the patients benefitted by the means we employed to keep up the system, and guard against the depressing action on the heart which the toxins exert in such a powerful manner. We have to stimulate the heart and keep it working for four to six days while the disease is at its height. After this if the patient survived so long, convalescence sets in, and the usual nutritious diet and tonics, &c., restored the patient to health.

The treatment of the buboes was always carried out with a view to relieve pain and to lessen the inflammation. Poultices usually were avoided, as they tended to increase the inflammatory processes and bring on suppuration. Glands in which this took place were always opened, but it must be confessed that they healed much more slowly, and the patient recovered his strength much more tardily than when re-absorption took place without suppuration. With this aim in view, hot lead lotion and extract of belladonna and glycerin were the most favourite local applications. The natives in these parts almost invariably performed a modified form of cupping. This consisted of scarifying the skin over the inflamed area either with a razor or with the sharpened finger nail. They then applied a conical shaped hollow horn, which was open at the base and had a small perforation at the apex. The base was applied to the scarified surface, and by means of applying his mouth to the apex of the horn the operator sucked until he got out a certain amount of blood. The process was a dangerous one, and most of the people who performed this operation, as a profession, were attacked with plague, sooner or later.

Leeches were also largely resorted to by the native Hakims. The result of this local blood-letting always relieved the pain of the swelling; but it is doubtful whether the patients, already very low and depressed, could stand the extra strain of losing blood.

Complications were treated, as they arose, according to the ordinary rules in medicine. Hyoscymus and bromide of potassium were the chief narcotics used to allay delirium and produce sleep. But opium in its various forms was well tolerated. There is a prejudice against the use of chloral in large doses in this disease.

Quinine also was found too depressing. Strophanthus was tried in the early part of the epidemic, but did not give better results than digitalis, which is an excellent heart tonic in this disease.

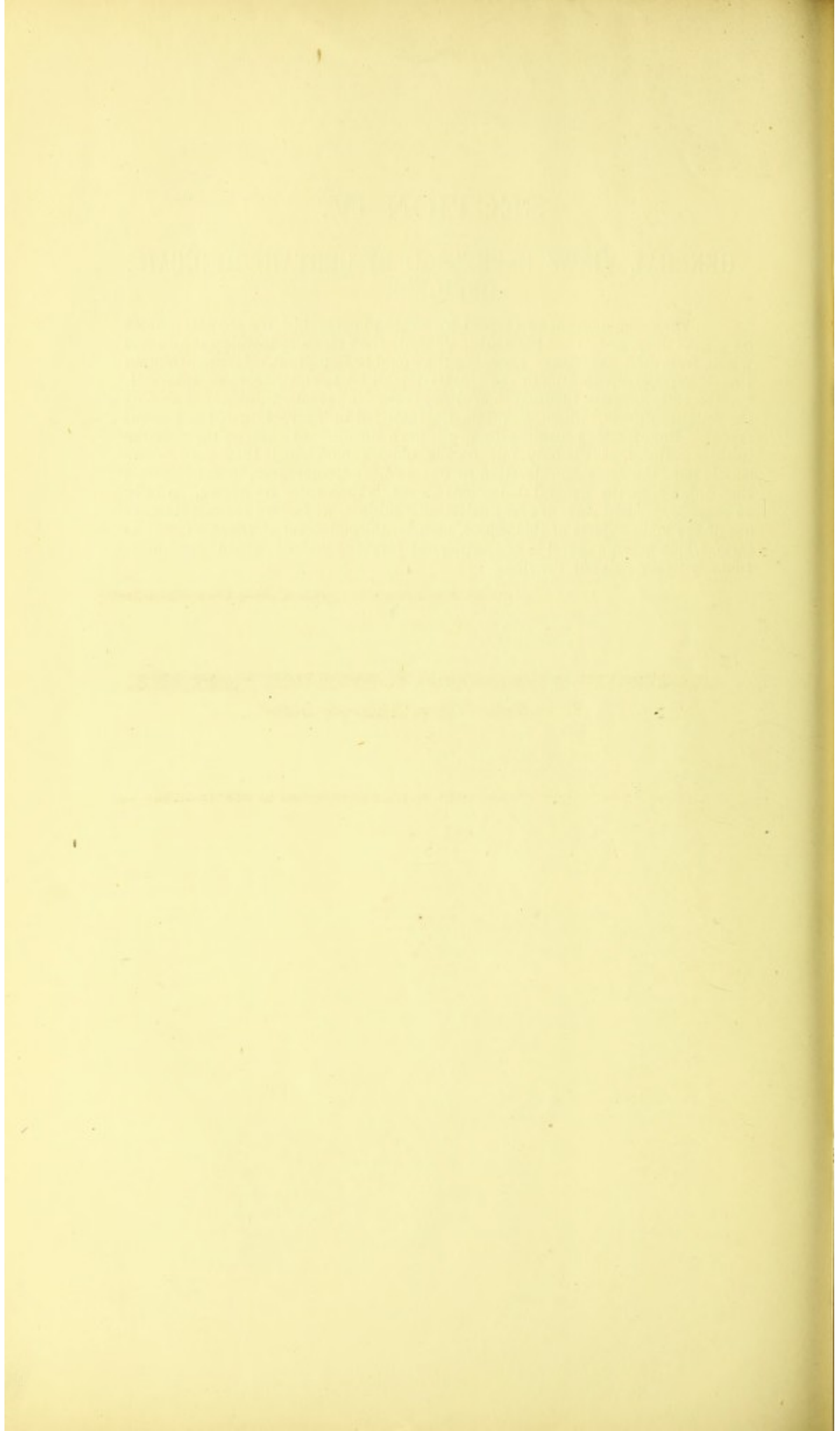
TREATMENT BY HAKIMS.

Hakims were always encouraged to help us in the treatment of the cases. They almost invariably adopted our methods of treatment, with the exception that they preferred the local blood-letting to our sedative and anodyne applications.

SECTION IV.

GENERAL VIEWS EXPRESSED BY CERTAIN MEDICAL OFFICERS.

When commencing this report we wrote to several of the medical officers on plague duty, and asked them to kindly send us any views concerning the disease which, from their experience, they thought would be important. Surgeon-Captain Ronaldson Clark, working in the Hoshiarpur district, and Surgeon-Captain H. Smith, and Surgeon-Lieutenant Walton, in the Nawashahr Circle, have sent us the following notes, which we originally intended to incorporate in the general report. But after due consideration, we have decided to send up the remarks in their entirety, as it is only fair on the officers concerned that their views should have the same consideration as our own, and, moreover, in some points they differ from the general deductions already expressed. By giving, as fully as possible, the two sides of every debateable subject, we feel we are carrying out one of the main objects of this report, namely, the collection of views, as well as facts, which may be useful in combating any further epidemics which may unfortunately again visit our Province.



A.—REMARKS BY SURGEON-CAPTAIN W. RONALDSON CLARK, I.M.S.,
Plague Medical Officer, Hoshiarpur District.

REMARKS BY SURGEON-CAPTAIN W. RONALDSON CLARK, I.M.S.

As to the question of the spread of the disease from village to village by means of infected rats, no evidence is obtainable in any of the villages. I have enquired carefully into this question in all the villages, and in only two of them have I been able to obtain any clear history at all as to the rats having become affected. These two villages are Parowal and Garhshankar, and in them the onset of the disease in the rats occurred some days after the first human cases. In Parowal on the day that the second death occurred in the village from plague the villagers began to notice an unusual number of deaths among the rats, and in Garhshankar I am told that in the affected *pattis*, about the middle of April, after the disease was well established, the people began to notice that the rats were dying "in hundreds," and that they used to come out of their holes in a semi-dazed condition, and die in the streets. At the same time the people say that when they left the town there were lots of rats in it, apparently quite healthy, and that there had been no disease amongst them except in the infected *pattis*. Subsequently to the evacuation of the town the rats also seem to have left it, for during the cleaning we saw none except dead ones, of which we found only a few. Thus in the first seven houses cleaned we found eleven dead rats, and in no subsequent part of the cleaning did we find many in any of the houses, whether infected or non-infected. Before the people returned to Garhshankar, and after cleaning operations were finished, I began to notice that the rats were again finding their way into the town, and that those I saw were plump, lively and healthy looking.

In none of the other villages that were cleaned while I was in medical charge of plague operations were rats found dead in any great numbers, and in most of them, indeed, I was told that, although rats had been plentiful in the villages before evacuation, yet evacuation and cleaning seemed to have banished them altogether.

The people in the health camps at Garhshankar had a large number of rats in their *chappars*, while they were in camp, but these were, they told me, field rats, and of quite a different species to the ones that formerly had infested their houses.

With regard to the spread of the disease by means of clothing I have already—*vide* my account of the origin and spread of the disease in Hoshiarpur*—detailed several instances in which this was apparently the means by which villages became infected. In Palewal, too, one of the cases which occurred, *viz.*, that of Radho, in whom the disease appeared on the 11th June, may have got infected from the clothing of her grandson. She was an old Rajput woman, and bed-ridden, who lived in a part of the village quite separate from the original cases. Her grandson, a youth whom I had inoculated, lived with her, and she was in the habit of sending this boy daily to the house of Nathu, before they were segregated, to ask after the health of Nathu's family. The old woman got plague on the 11th June and died on the 12th, while her grandson, who had apparently carried the disease to her, escaped.

The details of disinfection of houses adopted by me were essentially those carried out by Dr. James also, so I need not go into them in detail. One thing, however, I would like to mention, *viz.*, that in all cases in which Dr. Hunter and I had anything to do with the disinfection of villages we insisted on the infected houses being cleaned first, and I think it is of importance that this should be done. Our reasons for this step are as follows:—(1) As long as houses which are known to be infected are allowed to remain uncleared, they are a distinct source of danger to all who may happen to come into them; (2) if the rat theory is a valid one, the sooner these foci of infection for rats are got rid of the better; (3) since if from any reason the cleaning has to be completed in a hurry and the people allowed to re-occupy the village, they at any rate will have been dealt with in a thoroughly satisfactory fashion. I am aware that Dr. James prefers to clean the village from end to end, making no distinction

* Parowal, Chinkoa, pages 88 and 91.

of infected from non-infected houses, and that he says the danger in cleaning the infected houses first lies in the difficulty of obtaining a complete list of them, and in the fact that if infected houses are first cleaned subordinates may be inclined to scamp the cleaning of the so-called uninfected ones; but, on the other hand, I do not think we are justified in putting off the disinfection of known foci of infection because there may be others unknown, and with careful supervision I do not think it at all necessary that the cleaning should be scamped even after the infected houses have been completed. Our ideas in the matter of cleaning were that we should be as careful in the cleaning of all the houses as if they were all infected, but that at the same time we should begin by getting rid of all the known points of danger.*

Another point on which I would lay stress is the fact that Dr. James uses no solution of known strength as a disinfectant. This is, I think, unsatisfactory. Our aim in disinfection should be to make it on all points as complete as possible, and although solutions of phenyle (1-200 or less) may have been found by him to yield good results in the instances he has met with, yet laboratory experiments have proved such a strength to be insufficient in dealing with many pathogenic organisms, and our practice, in all points, ought, I think, to be at least what has been found in accurate experiments to be sufficient, not what our own limited experience has found to be in a general way satisfactory in the instances that have occurred to us.†

The disinfection of the persons and personal property of the inhabitants of infected villages has been, in all its details so far as known to us, carried out as in the Banga Circle. I have no further observations to make on this, except to say that it will be necessary, should these operations have to be continued or extended in the Punjab, to obtain some form of portable steam steriliser which can be used for this purpose. Disinfection done in the present fashion by plunging articles into boiling phenyle ruins many things, and consequently villagers try to escape it by burying or concealing their things before the time comes for disinfecting them. Such a course is most dangerous, but will be persisted in till they find that apparatus are provided which do not ruin their household goods. If plague operations are continued, I think it absolutely necessary that some apparatus, such as either Recks or Threshes portable disinfectors, be provided in infected areas. The initial cost of such apparatus would be, of course, considerable (£136 in the case of the former), but, after all, the money spent on phenyle for disinfecting the personal property of a small town like Garhshankar comes to about one-fourth of that amount, so that a portable apparatus would shortly pay for itself.

With regard to isolation and segregation of the people in infected towns I am not aware that any special remarks are necessary for the Hoshiarpur district. As to the necessity or otherwise for the complete evacuation of villages, my experience is, of course, limited, as it was only for a period of a little over two months that I was on plague duty, but my former experience in England of work in small-pox—a disease much more infectious to the unprotected than is bubonic plague—conjoined with what I know of the primary partial evacuation of Bilron, leads me to doubt whether wholesale evacuation is always necessary in villages and small towns, provided that sufficiently early notification is obtained. In Leicester small-pox has been treated, and hitherto successfully, in a practically unvaccinated community by means of isolation of the sick, segregation of their families, and early disinfection of their houses and property; and I fail to see why this should not be done with regard to plague also, provided that sufficiently early notification is obtained. In Rampur Bilron this was the case. Information was early received; what were absolutely the first two cases were isolated along with all the families living in the infected quarter of the village within six days of the occurrence of these two cases: the disease did not spread, only one other case (a separate infection from another quarter) occurred 23 days after the one first discovered; disinfection of the infected quarter was early

Isolation and segregation.
Necessity for total evacuation.

* See page 113.

† See page 111.

carried out; the isolated people returned to their homes, the village was declared free and the cordon removed. Thereafter a second infection occurred, wherein, as this was not so early intimated and the infection was received in two quarters almost simultaneously, the whole village had to be evacuated. This second infection had, however, *nothing to do with the first one*, in which the partial evacuation was completely successful.*

Bachwan, too, is another instance where early isolation, conjoined perhaps with partial evacuation, was the means of staving off an outbreak. This is a village 12 miles from Simul Mazara, and the residence of Albela and his son, Maula, who brought the infection to Simul Mazara itself. These men, on the 26th January, came from Shikohpur in the Jullundur district; they stayed the night with Albela's daughter, Risi, at Simul Mazara, and on the 27th pushed on home to Buchwan. On the way Maula became ill, had headache, diarrhoea, vomiting, cough and pain in the chest, and he died that night on reaching his own village. Fortunately, he was not taken into his own house where the whole family was, but to a detached *haveli* on the outskirts of the village. Thirteen days afterwards the occurrence of this case was discovered; Albela's family was placed in sheds outside the village, and kept in quarantine for 10 days; the *haveli* in which Maula died was disinfected and unroofed, and all suspicious property was burnt. No further cases occurred: a result attributable, I think, entirely to the accidental isolation of the first case in this *haveli*. If this as well as the partial evacuation that was carried out in Bilron on the 5th February could be successful as it was, there is, I think, nothing to prevent a similar result being obtained in other villages and small towns, provided that sufficiently early notification is received, the cases and their friends are early isolated, and disinfection of the affected houses is early carried out before the disease has had time to spread either among the human beings or the rats of the village.†

Having regard, therefore, to the particular advantages of this method, I think the results at Bilron and Bachwan are sufficiently encouraging to lead us to try and extend it, especially as it is applicable to the larger towns; and to strain every nerve to obtain by every possible means early notification of the occurrence of cases of plague. Small difficulties only exist with regard to the last two of my recommendations, *viz.*, early isolation of the sick and their friends, and early disinfection of infected houses, but it is around the first one, *viz.*, early notification, that all the difficulty centres. I have already, in my report to the civil authorities, mentioned what I think must be done before we can have any hope of obtaining this; and although the matter is not strictly a medical one, yet it seems of such vital importance that I may repeat here what I said in my former report:—"The one method which offers the most difficulties among all these is, I think, early notification, as that is dependent on the good will of the people themselves, and I think their good will must in this case be stimulated by some system of rewards and punishments. I do not advocate the indiscriminate giving of rewards to people who notify the disease, this would in all probability lead to the importation of cases, but I think a really handsome reward should be paid to *lambardars* who give early intimation of the occurrence of cases in their villages and a severe punishment meted out to those who neglect to do this. At the same time very handsome terms in the way of compensation for loss of employment and for damage done by disinfection should be given to those people who are unfortunate enough to have the disease among them."

If early notification is obtained, early isolation and early disinfection may be practised; and in this connection I may mention that the results we got from the rigid carrying out of the rule ordering us to let 10 days lapse between total evacuation and the commencement of disinfection do not seem to have been sufficiently encouraging to lead us to continue this in the future. The point of the rule, as I understand it, was to let 10 days lapse wherein the village should be quite undisturbed, the rats allowed to wander from house to

* See page 123.

† Bachwan was not given in the Hoshiarpur Plague Returns.

house, become infected and die in as great numbers as possible. Such a result was not, however, obtained even when the rule was rigidly carried out. In Bilron and Bhagwain full ten days were allowed to elapse before disinfection was begun; there had been no previous history of any excessive mortality among rats, but the cleaning of the village did not reveal any great number of dead rats in any of the houses. In both these villages I had given strict orders that the discovery of dead rats should be reported to me, and their bodies preserved for examination, but in neither of them did I have any great numbers presented for my inspection. It is therefore my opinion that, having regard to the positive danger of allowing infected houses to remain in a village and the possible danger of rats becoming infected as well as human beings, we should, in all cases, at any rate where early notification is obtained, disinfect the infected houses as soon as evacuation is accomplished.

The hospitals which we used for plague cases were, as far as possible, modelled on those used by Dr. James in the Jullundur District. The hospital camps should be strictly cordoned off from the others, and provision must be made in them—(1) for the plague cases; (2) for the hospital establishment; (3) for the medical subordinates; (4) for the temporary isolation of doubtful cases. Such cases are bound to occur in every epidemic, and the people will certainly be more satisfied if doubtful cases are treated in separate huts than if they are removed to the general plague hospital. In the case of a small village with few cases affected the large hospital huts need not be employed. It will be found that the people are better pleased to be isolated in small huts about 10 by 10 by 7 feet, and when there are few cases this does not entail much extra work on the hospital establishment.

The employment of Hakims offers no great obstacles in the administration of plague hospitals when the people are desirous to be treated by them. These men will, of course, have to submit to the same rules as to isolation, disinfection and quarantine as are binding on our own medical subordinates, and in cases where I have had to deal with them, I have found them very amenable to such. Arrangements must, of course, be made to give them a certain number of huts for the reception of their sick, and that they shall be able to obtain the drugs they require from the camp shop-keeper. When the people wish to employ Hakims, it is fair, I think, that the Hakims' hospital should be placed on the same footing as the Government one, with regard to the gratuitous supply of medicines and the dieting of those who are too poor to supply their own. The Hakims should be made to understand thoroughly that, as regards the discharge of their patients and in all questions of isolation and disinfection, they have no power to do anything without the advice of the medical officer, and all their bills should go through the medical officer's office for countersignature. The Hakims at Garhshankar were a most intelligent set of men, and by the end of my time there, I found that they had become so impressed with the superiority of antiseptics in the dressing of wounds that all the open buboes in their hospital were cleaned with antiseptic lotion and dressed with Iodoform.

With regard to the medical establishment and observation staff, I have little to say, as I expect Dr. James will have gone very fully into this question. I would only remark that the employment of civil officers on observation duty seems to me of doubtful utility. They cannot be expected to diagnose doubtful cases of plague, in such they have at once to send for a medical officer. I fancy the point wherein they are supposed to have the advantage of the medical officers is in their magisterial functions, but these are, it seems to me, very seldom called into requisition in observation work, and even if magisterial powers are required, a tahsildar is usually available who will do all that is required. Medical officers and subordinates who are employed on observation work should unquestionably have had some previous experience in plague work. It is absurd to have an observation staff like that which it was proposed to employ in Garhshankar tahsil, consisting of two hospital assistants and one *dharī*, only one of whom had ever seen a case of plague at all.

I have already in my report to the Deputy Commissioner gone into this question at length, and will now merely quote what I said there:—"I do not think that in future outbreaks so many medical officers need be employed. If young, active, healthy men are selected it will be much more satisfactory to have one man in charge of plague operations in the case of an outbreak like the Hoshiarpur one, than two men who may have entirely different ideas, and who will be continually at variance with one another as to the best methods of combatting the epidemic. I do not bring this matter to your notice because of any hitch in the relations that existed between Dr. Hunter and myself. Nothing could have exceeded the cordiality of these, but he and I are at one in saying that either of us could have, with adequate assistance, done the work just as well had the other not been here, and that it was quite unnecessary to send the two men. It is, we think, a waste of skilled labour for a medical officer to be employed in inspecting the cleaning of every house in a village and passing it as satisfactory or not, or for him to have to sit all day in the sun, and watch the disinfection of villagers before re-admitting them to their village, and yet these have constituted the most laborious part of our work. Such duties could be done just as well by assistant surgeons, or even, I think, by non-medical European supervisors. The whole epidemic in the Hoshiarpur district could have been managed most satisfactorily, and the medical officers, who were sent in the beginning, would not have been overworked, as they undoubtedly were, if they had been relieved of the more laborious and less important portions of their routine work either by assistant surgeons or by European supervisors. I am aware that in expounding the view that non-medical European supervisors could do the routine work of disinfection we are running counter to the ideas of both Drs. James and Wilkinson, but at the same time we cannot see why with a little training a European non-commissioned officer should not be trusted with this work under the medical officer. The chief objections urged by the Banga medical officers seem to be that a European supervisor could not remain all day at the work, which would then necessarily be left to the care of the hospital assistant. This, however, is what occurs at present. The medical officer has other duties, and cannot always be present throughout the disinfection of each village. They also say that non-medical inspectors would not have such a clear view of the dangers attaching to careless disinfecting. This may be so, but all the disinfecting at home is done by non-medical sanitary inspectors, and, although these are, of course, trained men, yet that is necessitated by the more complicated nature of their duties, and for the simpler work that would be entailed on a man employed on plague disinfection work in Punjab villages, I cannot understand why anything more is necessary than a *trustworthy, intelligent* man who on taking up these duties would be trained practically by the medical officer, and made to understand that in all matters connected with disinfections he is distinctly under the orders of the medical officer." Dr. James says he would be sorry to have the supervision of his good hospital assistants entrusted to bad European supervisors. Certainly, but why employ bad ones. Surely there are some intelligent and trustworthy non-commissioned officers in British regiments, and if the first supervisors obtained are not so, let us return them, and go on till we can get satisfactory men. The class is exactly that from which the European Sanitary Inspector is drawn, and good material must be available if we can get it.* "The employment of young Staff Corps officers for this work has been advocated, but is, I think, impracticable on account of difficulties with the rank question. It is a very exceptional Staff Corps officer who would take the orders of a medical officer hesitatingly at all times, and carry them out to the letter."

No cordon of only 8 men to the mile could possibly be effective. With Police cordons. Have crops on the ground, and a thorough knowledge of every nullah and ditch, a determined man could without difficulty pass through such a cordon by day or night, and even after the crops were gone the villagers, knowing all the inequalities of the ground and the position of each sentry would have no difficulty in passing through them aided by the darkness. Without therefore making any aspersions as to the venality of the policemen I have no hesitation in saying that the cordons were not effective, and I myself

* See page 108.

know instances in which they were passed both by night and by day. Thus a man in Bilron used frequently to pass through the cordon both of that place and of Palewal to visit a woman with whom he had an intrigue at the latter place, and the woman, on one occasion at any rate, went to Bilron from Palewal in broad day-night, and was accompanied part of the way by a constable who confessed that he had done so, and was punished for this offence. Numerous stories exist as to the various places in which the cordon was successfully passed either with the connivance of the constables or secretly, and one hears all over the country about the rich harvests that police constables, hospital assistants and compounders have reaped whilst on plague duty.

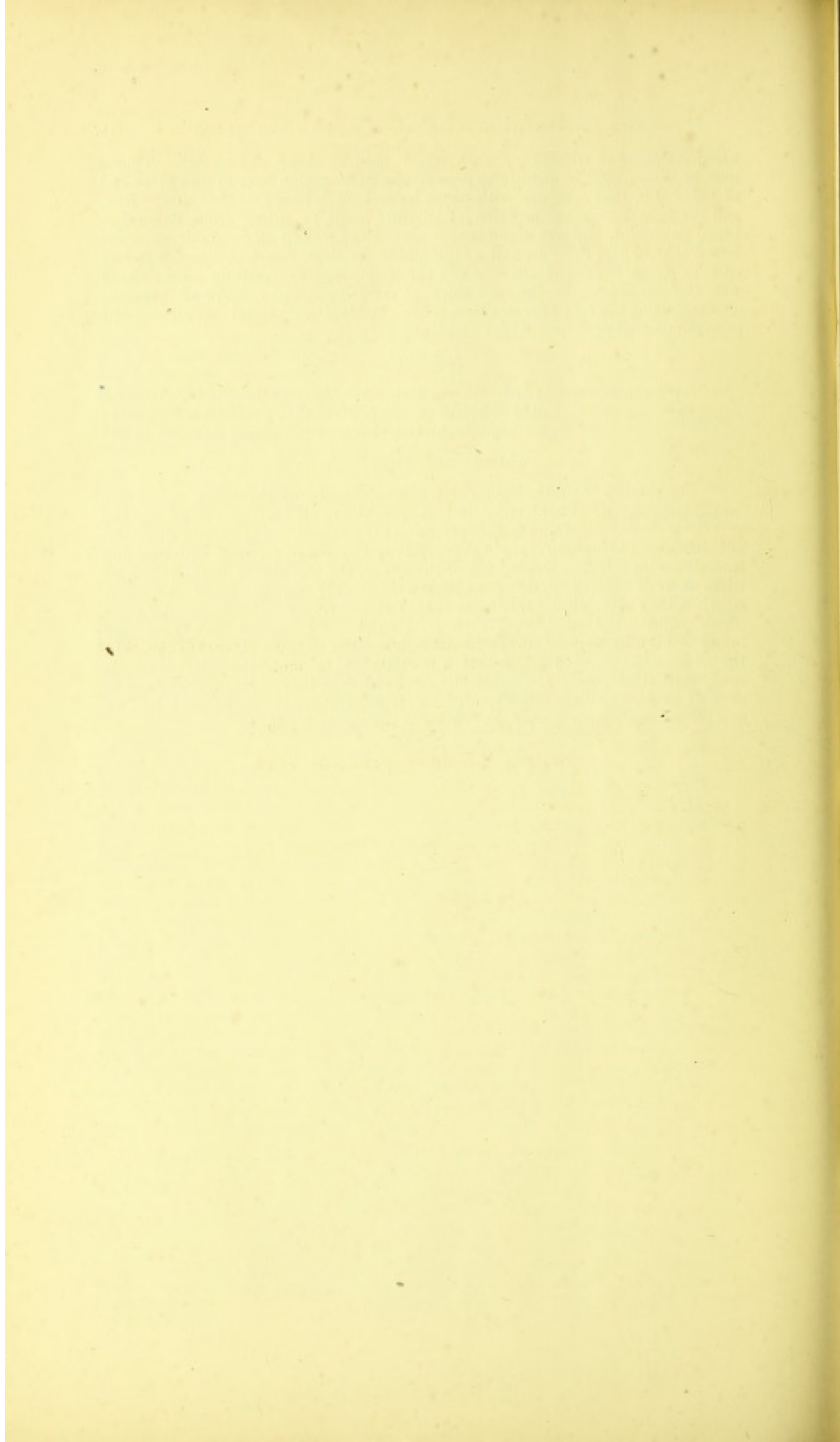
Inoculation.

A separate account of the inoculation work that was done in Garhshankar tahsil has already been submitted to the Inspector General of Civil Hospitals through the Deputy Sanitary Commissioner.*

Risks of disinfecting work.

In careless disinfecting these are undoubtedly considerable, but where disinfection is carefully done, all dust kept down and the whole of the interiors of the houses sprayed with disinfectant solutions before any coolies are allowed to enter, all men with cuts and wounds on their bodies weeded out of the gangs, the wearing of boots and shoes while at work insisted on, the gangs bathed thoroughly and their clothes disinfected when they come off duty, the risks are, I think, very small indeed. All cases which occurred in Garhshankar after Dr. Hunter and I came on duty there were found to have happened through the non-observance of some of these rules. In the villages last affected we made it a practice too to inoculate all the people who were employed on the disinfecting gangs before they went on duty, and in none of the three villages thus treated, viz., Garhi, Bhagwain and Palewal, had we any plague cases from among the coolies of the cleaning gangs.

* Page 141.



**B.—NOTES ON THE PLAGUE OPERATIONS IN THE NAWASHAHR
CIRCLE, JULLUNDUR, JULY 1898.**

BY

SURGEON-CAPTAIN H. SMITH, M. D., I. M. S.,

Plague Medical Officer, Nawashahr Circle.

REMARKS BY SURGEON-CAPTAIN H. SMITH, I. M. S.

Theories of Infection.

In the 21 villages of this Circle * (Nawashahr) I think I have been able to prove to a demonstration that the original infection of each village was done through human agency, and my observation is that the spread of the disease within the villages was due almost, if not entirely, to the same agency. In some villages it affected those who associated together, and in others, in which there were factions, those amongst whom it had been originally introduced. In this connection I invite attention to the case of Kariha, noted in page 79 of Section I of this report, and to the annotated map of Kariha forwarded herewith.† Knowing from our observation that the disease is not one of those intensely infectious diseases such as small pox, measles, scarlet fever or typhus fever, it is not surprising that men who associate intimately together convey the disease to one another, and that in practice it takes a closer association than exists between men and rats to be of much practical potency. That plague is a very infectious and a most deadly disease to rats is undoubted, and it is also undoubted that having their abodes in and about houses they are also capable of conveying the infection to men. In this respect I think it most likely that rat contagion is conveyed through the handling of infected earth or things, or by the naked feet coming in contact with infected earth when there is any abrasion of the skin.

In this Circle there was no village, in which when unroofing operations were going on rats, either alive or dead, were not found. The dead rats were found in the roofs of the infected houses, and in other roofs than those of the infected houses, but generally in the roofs of the houses adjacent to those infected, and in such roofs there were no living rats found. Where colonies of living rats were found there were no dead ones found. This shows that once the disease got among a colony of rats it killed all that colony. In this Circle healthy living house-rats were observed in a number of instances in the camps, but not in the fields. There is nothing unusual about this. They followed the habitation of men and animals close to their village in search of food when the village was cleared out. Within the villages, diseased rats were found in the stage of delirium staggering about in unwonted places, and living diseased rats were found prior to the stage of delirium in search of water outside the houses. There is nothing strange in any of these facts. They are what we would expect. The fact that there was no village in which, when unroofing operations were proceeding, living rats were not found, and that in the roofs in which living rats were found no dead ones were found, and *vice versa*, leads us to the definite conclusion that the rats of diseased colonies did not go out of their way to associate with independent healthy colonies, and *vice versa*, and is convincing evidence that the rats did not roam about, as some would have us believe. I have been unable to find any history of rats having been observed wandering from village to village, nor have I been able to get any evidence of house-rats being found dead on the lines of communication from village to village. It is to be observed that the habitations of men and animals are the habitations of house-rats, and that they confine themselves thereto. They are quite distinct from field rats, and do not associate with them. These facts are quite consistent with what we know of other animals who claim an equal amount of intelligence, under similar circumstances of disease equally deadly to them, as I shall detail later on.

The doctrine that rats when their numbers are attacked by plague desert their abodes and seek for new homes in other colonies or in distant villages from dread of the disease, as they are said to do in the case of a sinking ship, implies a prescience and a reasoning intelligence which we find in no other of the lower animals under similar circumstances; even the villagers here have not displayed such intelligence. It is to be understood that the rats of a village have their homes and their family ties, if we may so speak, their everything within their own colonies. We find that animals in general suffer, or appear to suffer, considerable inconvenience when away from their homes, whether

* See pages 67 to 82.

† The map was not received.

driven away from the stress of circumstances or not, and we naturally infer that the instinct of animals to remain at home is based on a very sound instinct which finds a place in the reasoning animal called man. The analogy of rats leaving a sinking ship—if it is a demonstrated fact that they do so—has no analogy to rats fleeing from dread of plague. Rats in a ship live in her bottom. When she leaks, they are the first living thing to be affected by the water. High up in the ship there is no place for them. Water is not their medium, and they are forced by the stress of circumstances to flee before it. Rats in their colonies on land are in their home, and in their natural element, and there is no such stress of circumstances to drive them away unless we assume that they have a prescience and a high class intellectual and reasoning capacity—much higher than is to be found in the average human being under similar circumstances. A few instances of similar circumstances amongst the lower animals is illustrative of these views. A disease, known as rabbit plague, is most infectious and most deadly to rabbits, when it gets into a warren, the rabbits do not wander and carry it to distant warrens. They die in their abodes, to the last rabbit. When scab or rot—a very fatal and infectious disease—gets amongst a flock of sheep, the non-infected do not desert their pasture lands. The diseased animal seems to stay aloof from the rest. This is not as it appears. The diseased animal is not fit to go about with the rest of the flock, and they do not wait on it. The case of the rest of a flock of deer going away or keeping aloof from the “stricken” one is no instance in point. Deer are most keen in scent, and recognise the smell of dogs or powder on the “stricken” one, and flee from these smells as from their natural enemy. Just as a bullock starts and makes off when he comes on the scent of a tiger or a leopard. In these latter instances and in case of rats leaving a sinking ship there is no analogy with animals fleeing from dread of an impending disease. We are not aware of any instance in nature of animals fleeing before an impending disease—if we exclude man from the category.

I have investigated this question in Section I of this report, and collected the facts concerning rats with exceeding care, and have gone into the matter at considerable length,—knowing that all over India and elsewhere very vague ideas are prevalent, as to how infection is conveyed to distant places, and also as to how it is conveyed to places quite near, to each other. If we decide that rats carry infection from village to village, and that they carry it extensively within villages, then, as we cannot control the movements of the rats, all our efforts are futile to prevent the spread from village to village, or within large towns. If, on the other hand, we decide that it is conveyed by rats to a minor extent within the village, and that practically to adjacent houses, and that it is not conveyed, at all, from village to village by rats, then the disease is amenable to human control.

Evacuation of villages in this Circle has been carried on as in the Banga Circle.

Disinfection of villages has also been carried on in this Circle as in the Banga except that we did not dig up the floors, on the following grounds. The floor is a hard and comparatively impermeable surface to water. The germs of the disease in the floors must lie in the very superficial portion of it. Under such circumstances our disinfecting solution will reach them, and be retained for a sufficient length of time in contact with them to destroy them. If we dig up the floor we cannot expect to remove all the germs. But we must expect to bury a good crop of them. When the villager sows his seeds, he ploughs the ground in order to bury them and, I maintain, that digging up floors will have a similar effect on the germs of plague. Again, digging up the floor spreads and mixes the germs in the soil, which it at the same time loosens, so that the disinfecting solution does not so readily get at them, nor is it so long retained in contact with them as when applied to the ordinary undisturbed floor.

Disinfection of Camps.

In this Circle we disinfected only the segregation camps, both when the people first went into camp, and again before they returned to their village. The hospital patients, when leaving hospital, were in all cases disinfected.

Cordons were the same here as in the Banga Circle. I may mention that, for a good while the system of passes gave considerable trouble to me, and often greatly delayed important business. The orders then were that no one was to give a pass except the Assistant Commissioner. When I had to send a message to any of my subordinates, whether urgent or ordinary, I had first to find the Assistant Commissioner, and get him to grant a pass. As some of the villages of this Circle were as much as 13 miles distant from each other, and as we were generally out every day in different directions, the inconvenience and delay on urgent business caused by such a system can be easily understood. I am not complaining of having to ask *non*-professional men for what, after all, were purely professional passes. But, I am of opinion, that these should have been more under the control of the medical officers who know best what persons were most likely to carry infection, instead of being entirely in the hands of the Assistant Commissioners who could not possibly know who were the people most likely to carry infection.

Character of Disease.

The character of the disease and its complications and *sequelæ* were substantially the same as elsewhere. The only unusual *sequelæ* were one case of aphasia in a young woman, and two cases of spastic paralysis. The first case was perfectly conscious, and fully recognised everything spoken, but could not even whisper. She had never learned to write. She recovered. The other two cases were brothers, of middle age. The spastic condition affected all the muscles of the body. The regions most distant from the head were most affected. One of them was unable to stand when the village returned, the other recovered as far as to be able to go about with the aid of a stick. Their speech was somewhat of a "scanning" character, but not like the scanning speech of glosso-labio-laryngial paralysis. The last time I saw them, they appeared to be slowly recovering.

The only member of the hospital staff affected by plague in this Circle was a compounder, and the only member of the disinfecting establishment a Chamar, and in this case the infection was traced to his work.

I find that the erratic dropping cases, which occurred late in many of our villages, were largely due to the people stealing into their houses in the village at night from the camp to look after their property.

Treatment of actual plague in this Circle was symptomatic. If we had been disposed to try inoculation as a prophylactic, the vast amount of supervision requisite for our scattered hospitals and villages, a number of which were twelve miles or more distant, rendered such work impossible. Besides, our orders were to turn out the villages at once on the recognition of plague, and as we found that the disease ceased directly the village was in camp, I was of opinion that statistics drawn from such a source, under such circumstances, would be worth absolutely nothing from a scientific point of view. If on the recognition of plague in a village, it were cordoned and inoculated wholesale and left alone, statistics in such a case would be most valuable, as a test of the utility of the remedy.

NAWASHAHR :

8th July 1898.

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H. SMITH, M. D. M. CH.

Surgeon-Captain, I. M. S.

C.—NOTES ON THE PLAGUE OPERATIONS IN THE NAWASHAHR
CIRCLE, JULLUNDUR, FEBRUARY-JULY 1898.

BY

SURGEON-LIEUTENANT H. Y. WALTON, M. B., F. R. C. S., I. M. S.,

Plague Medical Officer, Nawashahr.

NOTES BY SURGEON-LIEUTENANT WALTON.

In the following notes I do not propose to give a systematic report on the plague preventive measures, adopted in the Nawashahr Circle, but merely to indicate a few points that seem to me to be of importance, and about some of which there appears to be some difference of opinion.

My observations were confined to the villages of the Nawashahr Circle, viz. :—

| | |
|------------|------------|
| Shikohpur. | Mahmudpur. |
| Sahlon. | Sodhian. |
| Kamam. | Aur. |
| Lodhipur. | Bajon. |
| Katbáron. | Piragpur. |
| Musapur. | Rasulpur. |
| Mahrampur. | Laroya. |
| Malpur. | Jhingran. |
| Hansron. | Bhanglan. |
| Chahlan. | Kariha. |
| Karnana. | |

Some of my views are founded partly upon the experience I gained of plague during nearly ten months' plague duty in the Bombay Presidency.

The subjects which I propose to consider are the following :—

- (1). Detection of plague in villages.
- (2). Police cordons.
- (3). Camps and hospitals.
- (4). Quarantine.
- (5). Disinfection of villages.
- (6). Infection of villages.
- (7). Treatment of plague.

(1).—DETECTION OF PLAGUE IN VILLAGES.

There can be no doubt that the concealment of the existence of plague in a village is a very easy matter, and that it was frequently and, in many cases, successfully carried out.

A few villages in the Nawashahr Circle, although surrounded by other villages in which plague was raging, appear to have got off scot-free. When one considers the nature and extent of business, agricultural and family connections between the inhabitants of neighbouring villages, it seems impossible to imagine that the inhabitants of these villages were never exposed to infection from without, or that they were all immune to the disease.

In very few cases do I think that we discovered the original plague cases: almost invariably we found several persons attacked, and often one or more dead.

Previous to a village being declared "infected" no systematic attempt was made to check communication with a similarly uninfected village. Probably a tolerably frequent occurrence was for plague to enter a village, and for the attacks, for some reason, to be few in number: a few corpses could easily be disposed of without exciting suspicion.

Surprise visits in my experience were invariably failures, although, as at Mahmudpur, plague was discovered in the same village by other means a few days later; and the number of sick left no doubt in my mind that at the time of the "surprise visit" the village was already infected.

In Bombay city I have repeatedly placed guards on all the exits of a single house, and searched the interior from the roof to the cellars, unsuccessfully, in cases where it was afterwards proved that a plague case was concealed. If this is the case in a single house how many hiding places must be available in an irregularly built, straggling village, or in the neighbouring crops.

Roll-calls in "uninfected" villages appear to me to be equally useless: there is no serious difficulty in impersonating a sick man unable to attend the roll-call.

In my opinion, it is of little avail to place any European officers on "inspection duty," except a medical officer, whose opinion is necessary to decide whether a given case is one of plague or not.

The only method of detecting plague at once seems to me to be through the local lambardars and zaildars. These officials have repeatedly told me that it would be impossible for any case of illness to exist in their villages without their knowledge. If the lambardars and zaildars were made personally responsible to the Plague Officer, and were required to report to him daily on the condition of their villages, and if *severe punishment was meted out at once* to all who failed to report cases of sickness, I think that the results would be more satisfactory than those obtained by a regular staff of men—many of them strangers to the district—told off to search villages, suspicious or otherwise. I believe that in only two cases were lambardars punished, under the Epidemic Diseases Act, for concealing plague. Certainly wilful concealment for several days was the rule in the Nawashahr Circle.

I do not think that any *severe* epidemic of plague in a village could be concealed, although, as I have stated above, I believe that where only a few persons are attacked there is little difficulty in concealment.

Rewards.

The system of offering rewards for information of the existence of plague in a village is open to many objections. I am not inclined to believe in the probability of plague being wilfully introduced into a village in order that the informer might draw reward, but I know of several cases where this system has aroused a great deal of ill-feeling between neighbouring villages, which will probably continue longer than the plague epidemic. Again, as at Sodhian, it sometimes happens that a reward is given to a man who afterwards proves himself to be rather deserving of punishment for wilful obstruction than of reward for assistance rendered.

I think, too, that there is a prevalent popular idea that Government must derive some great benefit from the discovery of plague in a new village, since it is prepared to pay so much for information!

(2). POLICE CORDONS.

Whatever may be the mode of conveyance of plague infection from village to village—whether by human or other agency—the fact has been clearly demonstrated that placing a cordon of police round a village, *after* it has been declared to be infected, invariably fails to stop the spread of the disease to another village. I do not consider this to be at all surprising, nor reflect in the least upon the zeal with which the police did their duty. How easy it must be for a determined man, with local knowledge of every *nullah*, field and lane in the vicinity, to evade the observation of police guards suddenly placed on duty in an unfamiliar place.

During the first three months of the epidemic the country was covered with high crops, under cover of which it must have been quite a simple matter to slip by a guard, even in the day time, much more so on a dark night.*

The greatest strength of any cordon was eight men to the mile—*i. e.*, with gaps of 220 yards between every two men. Although a cordon of any available strength appears to be inadequate to prevent resolute men breaking singly through it, I believe that even a numerically very weak cordon indeed has sufficient *moral* effect to prevent emigration on any large scale. After all, the majority of people who leave an infected village presumably have not got plague.

It seems to me that their desire to leave the infected spot is a perfectly legitimate and natural one, and that—as I have suggested under the head of “Quarantine”—it would not be a source of the least danger if it were encouraged.

Believing, as I do, that any cordon, however weak, does discourage attempts to leave a village on a large scale, I consider that a given number of *sipâhis* would be more advantageously employed if a few sentries were placed, at the beginning of an epidemic, round *all* the villages in the neighbourhood, with instructions to check, as far as possible, strangers coming and going, and to report the number of bodies buried or burnt day by day at the village burning ground, than, as under the present arrangements, in endeavouring to form an impossible barrier solely round villages known to be infected.

* I think Dr. Walton must be referring to the time when he first came on duty—(February). The fields were all bare in October, November and December, when the epidemic commenced.

It has been suggested that a single cordon covering a large circumference placed round the infected area would be more successful than separate cordons round infected villages, but, for the reasons given above, I consider that, besides being unfair to uninfected villages within the area, such a scheme is doomed to failure.

(3). CAMPS AND HOSPITALS.

(a). Camps.

The chief point of interest in connection with the camps in the Nawashahr Circle was that, owing mainly to the difficulty in obtaining *chhappar* huts in sufficient numbers the villagers were in many cases allowed to build their own camps.

This, I feel sure, was a mistake. It is most important, from the administrative and sanitary points of view, that the camps should be arranged in a regular, orderly way, in fact like a military encampment. It is impossible to adequately inspect an irregularly constructed camp, and the daily roll-calls can never be satisfactorily held. The huts built by the villagers were very much more solid affairs than those provided by Government, and the supports of the roofs were often formed by growing trees. If a case of plague occurred in such a hut it was a difficult matter to remove the hut to the "segregation camp" and to re-erect it there. The huts straggled over a large area of ground, and the police cordons required to surround the camps were consequently unnecessarily large.

During the heavy rains that occurred during the month of February, some twenty head of cattle died at Shikohpur alone.

I would suggest that rough shelters should always be provided for cattle when rain is expected.

(b). Hospitals.

A plague hospital should consist of two distinct parts: one for undoubted plague patients, and the other, at some considerable distance from the first, for "suspected" cases. A separate staff of servants need not be provided for the latter, with the exception of a "sweeper," as the patients' own friends could perform all the services required by the "suspected" men.

It may, perhaps, be objected to this dual nature of plague hospitals, that the number of "suspected" cases is very small, and that such a case can always be kept under observation in a small hut near the main hospital. Although it is quite true that during the height of the recent epidemic in the Nawashahr Circle one seldom had much difficulty in deciding whether a case of sickness was one of plague or not*, still it must be generally conceded that, more especially at the beginning and towards the end of an epidemic, a fairly considerable number of cases do present themselves, concerning the nature of which even those medical officers, who have had considerable clinical experience of plague, are, for a time at any rate, somewhat doubtful.

At one of the villages in the Nawashahr Circle—Sahlon—a case in point occurred. A young girl was shown to be suffering from fever (103°) and a large swelling in one parotid region, encroaching beyond the limits of the parotid gland. I sent the child to hospital with little doubt that it was plague. Shortly afterwards a swelling appeared on the other side of the face, and in 36 hours there was a continuous "collar" stretching from ear to ear. The child's temperature fell to 98°, no other symptoms of plague appeared, and in a few days she was quite convalescent. If there had been no plague about I should not have hesitated to call the disease "mumps," and as I felt very doubtful about the nature of the case, on the occasion of my second visit to the hospital I had the child "disinfected" and removed to a separate hut. In a day or two her mother was sent to hospital with undoubted mumps.

* The point that struck me most on first beginning work in the Punjab was the very "typical" symptoms that the large majority of patients presented. I had been on plague duty for the preceding three months at Satara, in the Deccan, where the type of the disease was quite different. Quite half the patients died without the development of buboes: or, at least, if these appeared they could only be detected at quite a late stage.

I spoke to Surgeon-Captain James about the case some time afterwards and understood him to say that he too had seen several cases of mumps in the Banga circle about the same time.

I could cite many other cases—notably one of a police constable, the diagnosis of which remained very doubtful.

It seems to me that one has no moral right to send to a plague hospital cases about whom there is the least doubt, and although I had had a considerable previous experience of plague in the Bombay Presidency, a good many doubtful cases came under my notice in the Nawashahr circle.

I do not think that setting aside a few huts, close to the plague wards, is sufficient. Such huts should be provided as a matter of routine,—at a considerable distance—at least 100 yards from the plague hospitals. These huts should only accommodate one patient, and if the case turns out to be one of plague, the hut should be taken to pieces, disinfected and exposed to the sun for several days, and the site on which it stood should be covered with grass and burnt.

Natives will never believe that a case is plague unless buboes are present. They are therefore apt to conceal the "early" cases—those that we are most anxious to get to hospital, and for whom we can do most. But if the friends of the patient know and see that, as long as there is the least doubt about the nature of a case, the patient will be kept quite apart from the plague hospital, they have little or no object in concealing any cases of illness that may occur.

Latterly, when the strain upon the police was very heavy the hospital and segregation camps were quite inadequately guarded. There would have been little difficulty at night in persons visiting their friends in hospital, and I have no doubt that this often occurred.

(4). QUARANTINE.

No facilities were offered to people wishing to leave an infected village, and, as I have already mentioned under the heading of "Police cordons," I am inclined to think that most of the instances of cordons being broken through are to be attributed to this fact.

It is quite natural for people to wish to remove themselves and families from a plague stricken village; and, provided that it can be done without exposing other places to the danger of infection, this should rather be encouraged than otherwise. I would suggest that a central quarantine camp might be provided in each "circle," and that persons wishing to leave a village, at any stage of the epidemic—before, during or after their villages have become infected—be allowed to enter the camp, and that they be made as comfortable as possible, during their stage there.

As regards the period of detention I consider ten days too short. Two cases occurred within my experience in which after very careful investigation I was convinced that the period of incubation—or at least the period that had elapsed since the last date of possible contact with a plague case—in these two particular instances, was ten days. This I admit quite exceptional, and these instances were the only two that occurred among a very large number of people. I would recommend that in such a camp as I advocate fifteen days—or, at the least, twelve days—be the period of detention. Separate huts should be provided for each family, and the quarantine camp should be sub-divided into three parts after the expiry of five (or four) days, people should be moved to the next section and after ten (or eight) days to the third section. At every transfer the people and their belongings should be thoroughly disinfected. By the time an individual reached the second camp, there would be little risk of him getting plague; if he did, however, those living with him would have to start their quarantine afresh in the first camp.

As regards the question of Quarantine *v.* Inoculation by M. Haffkine's method, I think that our experience of the latter is not yet sufficient, and that such evidence as is available can scarcely be considered favourable enough to warrant its adoption as an alternative to quarantine.

(5). DISINFECTION OF VILLAGES.

The selection of the most reliable method of disinfecting a village is one of the most controversial subject in connection with plague. The variety of views that are held about this matter are, however, really due to the fact that our knowledge of the natural history of the plague bacillus is by no means complete. Notwithstanding the large number of eminent scientific men who have been occupied with the subject of the life history of the bacillus, for some time past, both in Europe and Asia, the results obtained hitherto leave many very important points undecided.

M. Metchnikoff, at the Moscow Congress in August 1897, made the following remarks:—

"L'histoire naturelle du bacille pesteux, malgré une quantité de faits précieux et bien établis qui la concerne, est encore loin d'être complète. Nous ignorons notamment les conditions dans lesquelles le bacille se conserve dans la nature pendant de longues périodes. Depuis les travaux de Kitasato sur la grande sensibilité du bacille pesteux vis-à-vis de la dessiccation de l'insolation et des antiseptiques, on admet généralement que ce microbe ne peut se conserver en dehors de l'organisme que pendant un temps relativement très court, et encore en perdant la majeure partie de sa virulence. Ces faits n'expliquent pas suffisamment certaines observations épidémiologiques d'après lesquelles la peste serait—communiquée par des effets conservés pendant long temps à l'état sec, on encore par des marchandises expédiées à longue distance. En se basant sur ces données, on est amené à supposer l'existence d'une forme de résistance du bacille pesteux qui, jusqu'à présent n'a pas été rencontré."

The object of the disinfection of a village is, of course, to destroy the plague bacillus, but until we can reconcile all observed facts with laboratory experiments, the methods of disinfection adopted must always be more or less empirical and of the nature of experiments.

Practically, the results obtained are the best tests of the efficacy of the method employed, and up to the present, they have been very strikingly successful in the Jullundur District. Whether, however, sufficient time has yet elapsed to justify us in being sanguine about the future, is a matter of opinion.

I feel persuaded that "Phenyle"—the disinfectant employed—is unreliable for the purpose required. It was found impossible to keep the strength of the emulsion constant—this probably was rarely stronger than 1 in 500 and often considerably weaker. Considering that the period during which this emulsion was in contact with most parts of a house was of very short duration, and that the walls were coated with the accumulated dirt and grease of years. I cannot believe that any phenol compound would infallibly destroy even the least resistant forms of the plague bacillus; much less those forms endowed with great powers of resistance, referred to by M. Metchnikoff in the quotation given above.

No doubt the floors of the houses were subjected to a more prolonged contact with the disinfectant, but even this was only a matter, at most, of an hour or two, and I think it extremely unlikely that such a dilute emulsion would certainly destroy all the resistant forms of plague bacilli that it came across.

Is it then worth while going to the trouble and expense of using any disinfectant at all for spraying the houses?

Having regard to the admitted imperfection of our knowledge of all the forms of the plague bacillus it certainly is desirable to do so, but the germicide solution should be a powerful and reliable one. Perchloride of mercury, the disinfectant employed in Bombay, possesses both these qualities. It certainly is rather more difficult to use than phenyle, owing to its comparative insolubility, but this difficulty can easily be overcome. In Bombay I made and used very concentrated solutions of corrosive sublimate in water, with the addition of hydrochloric acid. These solutions were kept, made up, in bottles, the sides of which were marked with divisions, like a medicine bottle. The man in charge of the disinfecting gang poured the amount of solution contained between two of these divisions into water in a bucket, whose capacity had been measured beforehand. (A mark was painted, at a certain level, on the inside of the bucket, and the capacity of the bucket, up to that mark, was clearly painted on the outside of each bucket, there was thus no difficulty in ensuring that a solution of constant and known strength was employed in every case).

Perchloride of mercury has the additional advantage of being a powerful poison. Any scraps or crumbs of food, with which it comes into contact are poisoned—an important matter, since rats, and, according to Mr. Hankin, ants, too, so frequently serve as carriers of the disease. Indeed, according to M. Metchnikoff, as in the case of so many bacilli, the occasional "passage" of the microbe through an animal of a different species is necessary to prevent the attenuation and to exalt the virulence of the plague bacillus.

Of course, with perchloride of mercury a different pattern of pump to that recently used would have to be adopted; but this, I think, would be a very great improvement.

As it is, the metal pumps are expensive and, owing to the rough usage they receive at the hands of ignorant coolies, are very liable to get out of order and become useless. In no village in the Nawashahr Circle, could I find a "mistri" capable of repairing any but the most trivial injury. In Bombay, square sided wooden pumps, of very simple construction, were used: even cheaper ones could easily be constructed of hollow bamboos.

Lime-washing is certainly of use, provided the lime is good and mixed only just before use. Its employment has the additional advantage that one can see at a glance whether all parts of the room have been subjected to it or not.

The villagers, too, seemed to appreciate the clean appearance that their houses presented, after being lime-washed. Perhaps this may stimulate the owners, for a time, to keep them so!

Roofs.—One of the best known facts in bacteriology is the potent influence of direct sunlight as a germicide. This effect is only to a minor extent due to the heat of the sun's rays: it is the actinic rays that possess this germicidal property in the most marked degree. Hence, it is not so much the exposure to fresh air that is to be desired, as that bright sunlight should have free access to every part of a room.

The ideal method of dealing with the houses in an infected village, would be to completely unroof them all. But practically, for various reasons, this is not often found to be possible. Certainly the roofs of all houses, in which plague cases are known to have occurred, should be completely removed, and it is well to remove those of the adjoining houses at the same time. As regards the other houses a strip of roof, running north and south, and extending from wall to wall, should be removed from each room. Owing to the great variation in size of the rooms it is impossible to give any definite dimensions applicable to all cases, but the strip should certainly never be less than four feet wide, and in large rooms it may be necessary to remove two or more strips. The only way of seeing whether enough of the roof has been removed is to visit the house, at different times of the day, and to notice whether, at one time or another, the sunlight reaches every part of the room.

"*Pukka*" roofs need not, as a rule, be removed. Where they are left, holes should be knocked in the side walls of the room to let in light.

Treatment of the floors.—In none of the villages of which I had charge in the Nawashahr Circle were the floors dug up. My reason for not doing so was that I consider that this operation is unnecessary, and even dangerous. It was originally the practice in Bombay city to dig up the floors of infected houses, but I found, in September 1897, that the practice had been discontinued, and with no bad results.

It is admitted that the floor is generally the most infected part of the room, hence the idea that it would be a good thing to remove it. But the practice of digging up two or three inches of the soil and carrying it outside to be buried or burnt cannot, I think, be expected to get rid of the infection. The floors of village rooms are made of mud and cowdung, firmly stamped down and are practically impermeable to water. The plague bacillus in the forms with which we are acquainted is an aerobic bacillus and therefore requires a free supply of air for its existence. It, therefore, almost certainly lives merely upon the surface of the floor, where it can be reached and dealt with by the ordinary chemical germicide solutions.

But, although the bacillus as we know it is aerobic, it is quite possible that, in its more resistant condition—spore stage, or whatever it may be—it may be able to remain dormant, for an indefinite period, buried under the surface, but ready to re-assume full activity and virulence when again exposed to a favourable environment.

When the floor of a room is dug up and removed, numbers of bacilli must remain behind, only to be buried a few inches below the surface, when the owner of the house re-prepares his floor. When the floor is again dug up for any purpose, or as the result of wear, the bacillus will again come to the surface, ready to start on a fresh career of activity. Perhaps like the tetanus bacillus, found in garden mould, it may often at first be almost non-pathogenic, but a few passages through rats or human beings would soon exalt its virulence.

Undoubtedly the best way of dealing with the floor is to spread a thick layer of grass over it, and burn the latter. An intense degree of heat is thus generated, which must be quite sufficient to destroy any form of bacillus that is exposed to it, either on the surface of the floor or a few inches beneath it. But, unfortunately, this method is not often practicable in dwelling-houses, as there is great danger of setting fire to the rafters, &c. In cattle sheds it may often be used with advantage.

All cattle sheds and out-houses should be treated in exactly the same way as the rest of the village. The villagers do not like their out-houses being disturbed, as a large number of them are filled with grain and forage. But it is precisely for this reason that great attention should be paid to such places.

When once the disinfecting gang is at work in a village, the rats leave the dwelling-houses, where they are constantly being disturbed, and take refuge in the quiet, outlying sheds. All stores must be removed and spread out in the sun, and the sheds must be disinfected and lime-washed with very great care. It is especially important in these cases to make an adequate opening in the roof, since, owing to the rough state of the walls and floor, it is difficult to ensure that all parts have been reached by the disinfectant.

The "ten days" rule.—This rule, namely, that no disinfecting work shall be begun in a village until ten days have elapsed since the village was evacuated—was, I believe, framed with the intention of allowing the infected rats to die undisturbed in the village, instead of carrying infection elsewhere.

But there is little or no evidence to show that diseased rats do leave an infected village, and the delay is inconvenient and unnecessary. It would be better for the village to lie "fallow" for ten days after the completion of disinfection instead of before its commencement. This would give the sunlight some time to exert its influence, before the village is re-occupied, and the holes in the roofs repaired.

MODES OF INFECTION OF VILLAGES.

(6). In most cases it is almost impossible to ascertain all the facts in connection with the introduction of plague into a new village.

The villagers, for fear of subsequent prosecution or other consequences, are naturally reluctant to relate truthfully all the circumstances connected with the outbreak, and lay the blame on one person—usually one who died of the disease, and to whom, therefore no ulterior consequences can ensue—whereas it might, with equal justice, have been laid upon several persons, who succeeded in breaking through a police cordon.

Whilst it is undoubtedly true that in the case of one or two villages in the Nawashahr Circle, *e.g.*, at Karnana, the evidence seems unequivocal that the disease was directly introduced by a single individual, returning from an infected village to a healthy one, it seems to me to be eminently unscientific to assume, in all cases, that because a man escaped from an infected to an uninfected village, therefore he was the one to introduce plague into that village. Sufficient evidence has been adduced to prove that clothes may be a source of infection, but I have never met a villager who considered the possibility of that being the mode by which plague entered his village.

My time was so fully occupied with other work, and I so soon became convinced of the futility of placing much reliance on the stories of interested villagers, that, to my regret, I was unable to accumulate much evidence on the subject of the mode of infection of given villages.

As regards the spread of the disease, *within a village*, I was much struck with the fact—originally pointed out to me by Surgeon-Captain James at Khankhanan—that, in every village, the disease appears to have passed from one house to adjoining houses, influenced merely by the proximity of the houses, and scarcely at all by the convenience of human access from one to the other. Thus, after the roofs of the infected houses had been removed, standing on an adjacent house top one could trace an almost unbroken chain of infected houses stretching often through several distinct quarters of the village. On enquiring into the caste and other circumstances of the inhabitants one often found that there could have been no common interests nor communication between the owners of adjacent houses—one might be a Brahmin and his neighbour a Chamar—and to pass from one house to the next, along the lanes of the village, it was often necessary to make a wide detour, leaving the village by one gate and re-entering it by another.

This very striking fact—one which was practically universal in the Nawashahr Circle—appears to demonstrate, almost conclusively, that the common mode by which plague spreads in a village is not by human intercourse. The agents which at once suggest themselves are rats or other vermin (cats, ants, ticks). These animals have their regular “runs,” and would naturally pass from one house to the next, undeterred by caste or other prejudices.

We know that rats died in large numbers in the infected villages: quantities were found by the disinfecting gangs in the Nawashahr Circle.

That rats ever carry the plague from village to village—except where one village is merely an extension of the first—was never proved in any of our villages. No rats were ever seen migrating, and to undertake long journeys is quite foreign to the nature of these animals.

That clothes or household utensils may be a source of infection was impressed upon my mind by the success that followed disinfection of these articles in a camp where the disease was spreading, (Shikohpur), but, as I have already mentioned under “Disinfection,” I would rather attribute the favourable results to the free exposure of the wet clothes to the sunlight, than to the disinfectant—phenyle—employed.

(7). TREATMENT OF PLAGUE.

As regards the treatment of persons suffering from plague, no one appears to be able to claim very satisfactory results; this of course, is only to be expected considering the nature of the disease, and the comparatively short experience that we have had of it. Plague, except perhaps in the very mildest and “abortive” attacks, is a septicaemia, and the ordinary treatment of septicaemias—essentially one of stimulation, to enable the patient to tide over the time until his tissues are able to elaborate means of dealing with the bacillus—has been practised by everybody.

Many drugs have been vaunted, and it has almost been claimed for some of them that they exert a “specific” effect on plague but, as in the case of most so-called “specifics,” no rational explanation is forthcoming as to their mode of action, nor to my knowledge, has it been demonstrated that the results so obtained are any better than those by any other method. Indeed such drugs are almost always administered together with stimulants, and probably any favourable results obtained are due to the latter alone.

Treatment by antitoxic serum is certainly the most rational for such a disease as plague: it is much to be regretted that it has not had a more systematic trial on a larger scale. I think that the favourable results obtained by M. Yersin,—unfortunately he had many unfavourable ones, too, due to the weakness of his serum, and to the late stage of the disease to which many of his patients had arrived—have scarcely been sufficiently appreciated. M. Simmond, who is at present trying some stronger serum at Karachi, sent out by the Pasteur Institute of Paris, should be more successful, but up to

APPENDIX A.

ESTABLISHMENT, FURNITURE AND EQUIPMENT OF TEMPORARY PLAGUE HOSPITALS.

I.—ESTABLISHMENT.

1. A Hospital Assistant.
2. A Compounder.
3. A Dhai or native nurse.

In the larger hospitals European Nurses were employed and were found most useful. In some of the smaller villages one Hospital Assistant without a Compounder, and even in extreme cases a Compounder without a Hospital Assistant was used. The arrangement on the whole worked well.

4. One Hospital Cook (Hindu).
5. One Bhisti.
6. One Sweeper.
7. Two or more Kahars, Jhinwars, or Ramdasis, who acted as dooli-bearers, ward orderlies, &c. These people also did the night watching—a most important item in the treatment of plague when delirious patients give trouble.

When the hospital contained more than 30 patients the above establishment (4, 5, 6 and 7) had to be doubled.

II.—HOSPITAL FURNITURE.

For a hospital consisting of two sheds for patients each shed holding 12 patients.

| | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|----|
| 1. Beds | ... | ... | ... | ... | ... | ... | 24 |
| 2. Bags of country cloth filled with <i>parali</i> grass for mattresses. On the patient being discharged from hospital or dying the grass is removed and burned and the bags boiled in phenyle lotion and re-filled | ... | ... | ... | ... | ... | ... | 30 |
| 3. Baths | ... | ... | ... | ... | ... | ... | 2 |
| 4. Blankets 50 in the warm weather and 100 in winter | ... | ... | ... | ... | ... | ... | 1 |
| 5. Box for medicine with lock and key | ... | ... | ... | ... | ... | ... | 1 |
| 6. Chair for office | ... | ... | ... | ... | ... | ... | 1 |
| 7. Gamlas (kunalies) | ... | ... | ... | ... | ... | ... | 30 |
| 8. Gharrabs for holding water, lotion, &c. | ... | ... | ... | ... | ... | ... | 10 |
| 9. Karahas. (These are large open iron vessels in which the villagers boil the sugar-cane juice in the preparation of country sugar. They were readily lent us and were most useful for boiling patient's clothing, blankets, bedding, &c.) | ... | ... | ... | ... | ... | ... | 2 |
| 10. Empty Kerosine tins. (These were fitted with wooden handles by the local village carpenter and made excellent buckets for carrying about bath water, antiseptic lotion, &c.) | ... | ... | ... | ... | ... | ... | 10 |
| 11. Lantorns (2 for wards—1 for dispensary) | ... | ... | ... | ... | ... | ... | 3 |
| 12. Native cooking vessels 1 degheha, 2 baties, (1 large, 1 small) 2 thalies (brass), 1 karchi, 3 katoras, 1 parat, 1 garwa, 1 dol, 1 baltohi and 1 loh. | ... | ... | ... | ... | ... | ... | 6 |
| 13. Native stoves (angithee) (in winter only) | ... | ... | ... | ... | ... | ... | 1 |
| 14. Pocket book | ... | ... | ... | ... | ... | ... | 1 |
| 15. Stationery—Pens, ink, paper ($\frac{1}{2}$ quire foolscap and 1 quire Hinai) blotting paper, inkstand, ruler and pencil. | ... | ... | ... | ... | ... | ... | 1 |
| 16. Table for office and dispensary | ... | ... | ... | ... | ... | ... | 2 |
| 17. Registers, 1 for patients and 1 for dead stock, &c. | ... | ... | ... | ... | ... | ... | 2 |

III.—MEDICINES.

These varied according to the method of treatment adopted by the Medical Officer in charge. But the following list was found to contain all the drugs most commonly required :—

| | | | | | | | | |
|-------------------------------|-----|-----|-----|--------|-------------------------|-----|-----|------------|
| 1. Acetas Plumbi | ... | ... | ... | 4 ozs. | 36. Lin. Camp Co. | ... | ... | } 2 lbs. |
| 2. Acid Acetic | ... | ... | ... | 2 " | 37. Lin. Terebith | ... | ... | |
| 3. " Boric | ... | ... | ... | 1 lb. | 38. Linseed Meal | ... | ... | 2 " |
| 4. " Carbolic | ... | ... | ... | 2 lbs. | 39. Magnesii, sulph. | ... | ... | 2 " |
| 5. " Nitric Fort. | ... | ... | ... | 2 ozs. | 40. " carb. | ... | ... | 1 lb. |
| 6. " Sulphuric Dil. | ... | ... | ... | 8 " | 41. Morphinæ Hydrochlor | ... | ... | 1 drm. |
| 7. " Nitro Hydrochl Dil. | ... | ... | ... | 8 " | 42. Olium Recini | ... | ... | 2 lbs. |
| 8. Aetheris Nitrosi Spiritus | ... | ... | ... | 8 " | 43. Opium | ... | ... | 1 drm. |
| 9. Alum | ... | ... | ... | 4 " | 44. Opii, Tinctura | ... | ... | 4 ozs. |
| 10. Ammonii, Aromat, Spiritus | ... | ... | ... | 8 " | 45. Phenyle | ... | ... | 4 gallons. |
| 11. " Carbonos | ... | ... | ... | 1 lb. | 46. Pil Rhei Co. | ... | ... | 4 ozs. |
| 12. " Acetatis Liq. | ... | ... | ... | 8 ozs. | 47. Potassii Bromidum | ... | ... | 2 " |
| 13. " Chloridum | ... | ... | ... | 4 lbs. | 48. " Bicarb | ... | ... | 1 lb. |
| 14. Argentri Nitras | ... | ... | ... | 1 oz. | 49. " Liquor | ... | ... | 4 ozs. |
| 15. Arsenicalis Liq. | ... | ... | ... | 1 lb. | 50. " Chloras | ... | ... | 8 " |
| 16. Belladonna Extrat. | ... | ... | ... | 1 " | 51. " Nitros | ... | ... | 8 " |
| 17. Bismuthi Subnitras | ... | ... | ... | 1 " | 52. " Permangan | ... | ... | 1 lb. |
| 18. Chlorodyne | ... | ... | ... | 4 ozs. | 53. Pulv, Ipecac. Co. | ... | ... | 8 ozs. |

| | | | | | | | |
|------------------------------|-----|-----|--------|--------------------------------------|-----|-----|--------------------|
| 19. Chloral Hydrat. | ... | ... | 8 ozs. | 54. Quin Sulphas | ... | ... | 2 ozs. |
| 20. Chloroform | ... | ... | 8 " | 55. Sodii Bicarb | ... | ... | 8 " |
| 21. Capri Sulphas | ... | ... | 2 " | 56. " Salicylas | ... | ... | 2 " |
| 22. Digitalis Tinct. | ... | ... | 4 " | 57. " Sulphas | ... | ... | 8 " |
| 23. Ergot Extrat Liq. | ... | ... | 1 " | 58. Spiritus Rectificatus | ... | ... | 1 lb. |
| 24. Ess Menth Pip | ... | ... | 1 " | 59. Spirit Methylated | ... | ... | 1 " |
| 25. Ferri Perchlorid Tinct | ... | ... | 1 lb. | 60. Strychnine | ... | ... | $\frac{1}{2}$ drm. |
| 26. Glycerine | ... | ... | 1 " | 61. Syrupus Phos. C Quinine C Strych | ... | ... | 1 lb. |
| 27. Hydrargyrum Perchloridum | ... | ... | 4 lbs. | (Easton's Syrup) | ... | ... | 1 lb. |
| 28. Hyd Perchloride Liquor | ... | ... | 4 " | 62. Tinct. Scillae | ... | ... | 1 " |
| 29. Hydrarg C. Creta | ... | ... | 2 ozs. | 63. " Camph. | ... | ... | 1 " |
| 30. Hydrarg Oxid Flavum | ... | ... | 1 drm. | 64. " Rhei | ... | ... | 1 " |
| 31. " Subchloridum | ... | ... | 2 ozs. | 65. Unguentum Hydrarg | ... | ... | 8 ozs. |
| 32. Hyoseyami, Tinctura | ... | ... | 2 " | 66. " Hyd. Nit. | ... | ... | 8 " |
| 33. Iodi tinctura | ... | ... | 4 " | 67. " Simplex | ... | ... | 1 lb. |
| 34. Iodoform C Borac | ... | ... | 4 " | 68. Zinci Suph. | ... | ... | 8 ozs. |
| 35. Ipecac. Vinum | ... | ... | 4 " | 69. Zinzerberis Pulv. | ... | ... | 8 " |

IV.—SUNDRIES.

| | | | | | |
|---|-----|-----|-----|-----|---------------------|
| 1. Country cloth for bandages | ... | ... | ... | ... | 16 yards. |
| 2. Carbolic soap | ... | ... | ... | ... | 2 cakes. |
| 3. Cotton wool for dressings | ... | ... | ... | ... | $\frac{1}{2}$ seer. |
| 4. Charcoal for fires | ... | ... | ... | ... | as required. |
| 5. Dressing trays | ... | ... | ... | ... | 2 |
| 6. Enema | ... | ... | ... | ... | 1 |
| 7. Feeding cups | ... | ... | ... | ... | 2 |
| 8. Feeding bottles for infants | ... | ... | ... | ... | 2 |
| 9. Galipots for ointments, &c. | ... | ... | ... | ... | 1 dozen. |
| 10. Hypodermic syringe | ... | ... | ... | ... | 1 |
| 11. Kerosine oil | ... | ... | ... | ... | 1 tin. |
| 12. Lime for the floors | ... | ... | ... | ... | 1 maund. |
| 13. Lint for dressings | ... | ... | ... | ... | 1 lb. |
| 14. Measures for one pint, one 4 oz. and one minim. | ... | ... | ... | ... | ... |
| 15. Pestle and mortar, wedgwood | ... | ... | ... | ... | 1 |
| 16. Pocket case | ... | ... | ... | ... | 1 |
| 17. Pill slab with spatula | ... | ... | ... | ... | 1 |
| 18. Phials and corks | ... | ... | ... | ... | 1 dozen. |
| 19. Rum | ... | ... | ... | ... | 10 pints. |
| 20. Rod (bamboo) 6 ft. long for measuring the depth of graves | ... | ... | ... | ... | 1 |
| 21. Scales and weights | ... | ... | ... | ... | 1 set. |
| 22. Spirit lamp | ... | ... | ... | ... | 1 |
| 23. Stethoscope | ... | ... | ... | ... | 1 |
| 24. Test tubes | ... | ... | ... | ... | 2 |
| 25. Thermometers | ... | ... | ... | ... | 2 |
| 26. Towels | ... | ... | ... | ... | 2 |
| 27. Wood | ... | ... | ... | ... | as required |

V.—DIET.

| | | | | | | |
|-------------|-----|-----|-----------|-------------------------------|-----|----------|
| 1. Ata | ... | ... | 1 maund. | 7. Salt | ... | 2 seers; |
| 2. Dal mung | ... | ... | 10 seers. | 8. Condiments,—Haldi, mirich, | ... | |
| 3. Chawal | ... | ... | 10 " | dhania, &c. | ... | 1 seer. |
| 4. Sago | ... | ... | 10 " | Milk and meat for soups to be | ... | |
| 5. Sugar | ... | ... | 10 " | supplied on indent | ... | |
| 6. Ghee | ... | ... | 5 seers. | | | |

APPENDIX B.

Table showing the Sex and Caste of the people attacked with Plague in the Jullundur District.

[illegible]

APPENDIX B.

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| 28 | 12 | 15 | 21 | 24 | 29 | 34 | 39 | 44 | 49 | 54 | 59 | 64 | 69 | 74 | 79 | 84 | 89 | 94 | 99 | 104 | 109 | 114 | 119 | 124 | 129 | 134 | 139 | 144 | 149 | 154 | 159 | 164 | 169 | 174 | 179 | 184 | 189 | 194 | 199 | 204 | 209 | 214 | 219 | 224 | 229 | 234 | 239 | 244 | 249 | 254 | 259 | 264 | 269 | 274 | 279 | 284 | 289 | 294 | 299 | 304 | 309 | 314 | 319 | 324 | 329 | 334 | 339 | 344 | 349 | 354 | 359 | 364 | 369 | 374 | 379 | 384 | 389 | 394 | 399 | 404 | 409 | 414 | 419 | 424 | 429 | 434 | 439 | 444 | 449 | 454 | 459 | 464 | 469 | 474 | 479 | 484 | 489 | 494 | 499 | 504 | 509 | 514 | 519 | 524 | 529 | 534 | 539 | 544 | 549 | 554 | 559 | 564 | 569 | 574 | 579 | 584 | 589 | 594 | 599 | 604 | 609 | 614 | 619 | 624 | 629 | 634 | 639 | 644 | 649 | 654 | 659 | 664 | 669 | 674 | 679 | 684 | 689 | 694 | 699 | 704 | 709 | 714 | 719 | 724 | 729 | 734 | 739 | 744 | 749 | 754 | 759 | 764 | 769 | 774 | 779 | 784 | 789 | 794 | 799 | 804 | 809 | 814 | 819 | 824 | 829 | 834 | 839 | 844 | 849 | 854 | 859 | 864 | 869 | 874 | 879 | 884 | 889 | 894 | 899 | 904 | 909 | 914 | 919 | 924 | 929 | 934 | 939 | 944 | 949 | 954 | 959 | 964 | 969 | 974 | 979 | 984 | 989 | 994 | 999 | 1004 | 1009 | 1014 | 1019 | 1024 | 1029 | 1034 | 1039 | 1044 | 1049 | 1054 | 1059 | 1064 | 1069 | 1074 | 1079 | 1084 | 1089 | 1094 | 1099 | 1104 | 1109 | 1114 | 1119 | 1124 | 1129 | 1134 | 1139 | 1144 | 1149 | 1154 | 1159 | 1164 | 1169 | 1174 | 1179 | 1184 | 1189 | 1194 | 1199 | 1204 | 1209 | 1214 | 1219 | 1224 | 1229 | 1234 | 1239 | 1244 | 1249 | 1254 | 1259 | 1264 | 1269 | 1274 | 1279 | 1284 | 1289 | 1294 | 1299 | 1304 | 1309 | 1314 | 1319 | 1324 | 1329 | 1334 | 1339 | 1344 | 1349 | 1354 | 1359 | 1364 | 1369 | 1374 | 1379 | 1384 | 1389 | 1394 | 1399 | 1404 | 1409 | 1414 | 1419 | 1424 | 1429 | 1434 | 1439 | 1444 | 1449 | 1454 | 1459 | 1464 | 1469 | 1474 | 1479 | 1484 | 1489 | 1494 | 1499 | 1504 | 1509 | 1514 | 1519 | 1524 | 1529 | 1534 | 1539 | 1544 | 1549 | 1554 | 1559 | 1564 | 1569 | 1574 | 1579 | 1584 | 1589 | 1594 | 1599 | 1604 | 1609 | 1614 | 1619 | 1624 | 1629 | 1634 | 1639 | 1644 | 1649 | 1654 | 1659 | 1664 | 1669 | 1674 | 1679 | 1684 | 1689 | 1694 | 1699 | 1704 | 1709 | 1714 | 1719 | 1724 | 1729 | 1734 | 1739 | 1744 | 1749 | 1754 | 1759 | 1764 | 1769 | 1774 | 1779 | 1784 | 1789 | 1794 | 1799 | 1804 | 1809 | 1814 | 1819 | 1824 | 1829 | 1834 | 1839 | 1844 | 1849 | 1854 | 1859 | 1864 | 1869 | 1874 | 1879 | 1884 | 1889 | 1894 | 1899 | 1904 | 1909 | 1914 | 1919 | 1924 | 1929 | 1934 | 1939 | 1944 | 1949 | 1954 | 1959 | 1964 | 1969 | 1974 | 1979 | 1984 | 1989 | 1994 | 1999 | 2004 | 2009 | 2014 | 2019 | 2024 | 2029 | 2034 | 2039 | 2044 | 2049 | 2054 | 2059 | 2064 | 2069 | 2074 | 2079 | 2084 | 2089 | 2094 | 2099 | 2104 | 2109 | 2114 | 2119 | 2124 | 2129 | 2134 | 2139 | 2144 | 2149 | 2154 | 2159 | 2164 | 2169 | 2174 | 2179 | 2184 | 2189 | 2194 | 2199 | 2204 | 2209 | 2214 | 2219 | 2224 | 2229 | 2234 | 2239 | 2244 | 2249 | 2254 | 2259 | 2264 | 2269 | 2274 | 2279 | 2284 | 2289 | 2294 | 2299 | 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5164 | 5169 | 5174 | 5179 | 5184 | 5189 | 5194 | 5199 | 5204 | 5209 | 5214 | 5219 | 5224 | 5229 | 5234 | 5239 | 5244 | 5249 | 5254 | 5259 | 5264 | 5269 | 5274 | 5279 | 5284 | 5289 | 5294 | 5299 | 5304 | 5309 | 5314 | 5319 | 5324 | 5329 | 5334 | 5339 | 5344 | 5349 | 5354 | 5359 | 5364 | 5369 | 5374 | 5379 | 5384 | 5389 | 5394 | 5399 | 5404 | 5409 | 5414 | 5419 | 5424 | 5429 | 5434 | 5439 | 5444 | 5449 | 5454 | 5459 | 5464 | 5469 | 5474 | 5479 | 5484 | 5489 | 5494 | 5499 | 5504 | 5509 | 5514 | 5519 | 5524 | 5529 | 5534 | 5539 | 5544 | 5549 | 5554 | 5559 | 5564 | 5569 | 5574 | 5579 | 5584 | 5589 | 5594 | 5599 | 5604 | 5609 | 5614 | 5619 | 5624 | 5629 | 5634 | 5639 | 5644 | 5649 | 5654 | 5659 | 5664 | 5669 | 5674 | 5679 | 5684 | 5689 | 5694 | 5699 | 5704 | 5709 | 5714 | 5719 | 5724 | 5729 | 5734 | 5739 | 5744 | 5749 | 5754 | 5759 | 5764 | 5769 | 5774 | 5779 | 5784 | 5789 | 5794 | 5799 | 5804 | 5809 | 5814 | 5819 | 5824 | 5829 | 5834 | 5839 | 5844 | 5849 | 5854 | 5859 | 5864 | 5869 | 5874 | 5879 | 5884 | 5889 | 5894 | 5899 | 5904 | 5909 | 5914 | 5919 | 5924 | 5929 | 5934 | 5939 | 5944 | 5949 | 5954 | 5959 | 5964 | 5969 | 5974 | 5979 | 5984 | 5989 | 5994 | 5999 | 6004 | 6009 | 6014 | 6019 | 6024 | 6029 | 6034 | 6039 | 6044 | 6049 | 6054 | 6059 | 6064 | 6069 | 6074 | 6079 | 6084 | 6089 | 6094 | 6099 | 6104 | 6109 | 6114 | 6119 | 6124 | 6129 | 6134 | 6139 | 6144 | 6149 | 6154 | 6159 | 6164 | 6169 | 6174 | 6179 | 6184 | 6189 | 6194 | 6199 | 6204 | 6209 | 6214 | 6219 | 6224 | 6229 | 6234 | 6239 | 6244 | 6249 | 6254 | 6259 | 6264 | 6269 | 6274 | 6279 | 6284 | 6289 | 6294 | 6299 | 6304 | 6309 | 6314 | 6319 | 6324 | 6329 | 6334 | 6339 | 6344 | 6349 | 6354 | 6359 | 6364 | 6369 | 6374 | 6379 | 6384 | 6389 | 6394 | 6399 | 6404 | 6409 | 6414 | 6419 | 6424 | 6429 | 6434 | 6439 | 6444 | 6449 | 6454 | 6459 | 6464 | 6469 | 6474 | 6479 | 6484 | 6489 | 6494 | 6499 | 6504 | 6509 | 6514 | 6519 | 6524 | 6529 | 6534 | 6539 | 6544 | 6549 | 6554 | 6559 | 6564 | 6569 | 6574 | 6579 | 6584 | 6589 | 6594 | 6599 | 6604 | 6609 | 6614 | 6619 | 6624 | 6629 | 6634 | 6639 | 6644 | 6649 | 6654 | 6659 | 6664 | 6669 | 6674 | 6679 | 6684 | 6689 | 6694 | 6699 | 6704 | 6709 | 6714 | 6719 | 6724 | 6729 | 6734 | 6739 | 6744 | 6749 | 6754 | 6759 | 6764 | 6769 | 6774 | 6779 | 6784 | 6789 | 6794 | 6799 | 6804 | 6809 | 6814 | 6819 | 6824 | 6829 | 6834 | 6839 | 6844 | 6849 | 6854 | 6859 | 6864 | 6869 | 6874 | 6879 | 6884 | 6889 | 6894 | 6899 | 6904 | 6909 | 6914 | 6919 | 6924 | 6929 | 6934 | 6939 | 6944 | 6949 | 6954 | 6959 | 6964 | 6969 | 6974 | 6979 | 6984 | 6989 | 6994 | 6999 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----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APPENDIX C.

Table showing the Sex and Caste of the people attacked with Plague in the Hoshiarpur District.

| Serial No. | NAMES OF VILLAGES. | SEX. | | | | LIST ACCORDING TO CASTES. | | | | | | | | | | | | | | | | | | | | REMARKS. | | |
|------------|--------------------|------------------------|--------------------------|--------------------------------|------------------------------|---------------------------|-----------------------------|---------|-------|----------------------|--------------|-------------|----------|--------|----------------------|---------|---------|--------|---|------------------|---------|-------------------|--------|---------------------|-----------|----------|----------|--------|
| | | Number males attacked. | Number females attacked. | Number females under 10 years. | | HINDUS. | | | | | MUHAMMADANS. | | | | | | | | OTHERS. | | | | | | | | | |
| | | | | Total. | Number males under 10 years. | Khatris and Brahmins. | Tarkhan, Lehar and Chitwan. | Jidwar. | Nath. | Rhuanars and Gajars. | Achary. | Margamwars. | Rajputs. | Total. | Mughals and Pathans. | Kasals. | Bharis. | Aryas. | Lehar, Tell, Tarkhan, Dhot, Sonar and Rajars. | Jats and Gajars. | Ravals. | Sayed and Sheikh. | Total. | Chamars and Ramdas. | Scorpers. | | Salists. | Total. |
| 1 | Bitampur | 28 | 14 | 5 | 47 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 21 | 21 | 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | Purkhorat | 10 | 10 | 1 | 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | Rampur Bileon | 15 | 14 | 8 | 37 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | Simal Mazara | 24 | 16 | 5 | 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | Derosa | 3 | 3 | 1 | 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | Bhajjal | 21 | 18 | 7 | 46 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | Sadhoval | 9 | 9 | 3 | 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | Hajipur | 31 | 49 | 7 | 87 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | Parrowat | 10 | 10 | 6 | 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | Garhshankar | 65 | 65 | 21 | 151 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | Sauwari | 6 | 8 | 1 | 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | Kalleral | 5 | 11 | 5 | 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | Garbi | 55 | 36 | 9 | 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | Chinkoi | 5 | 5 | 3 | 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | Bhagwain | 4 | 4 | 1 | 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | Palawal | 1 | 2 | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Total | 295 | 267 | 82 | 644 | 29 | 29 | 15 | 11 | 89 | 1 | 1 | 4 | 389 | 47 | 4 | 14 | 6 | 19 | 72 | 24 | 1 | 7 | 194 | 99 | 21 | 120 | 120 |

GARHSHANKAR :

G. Y. C. HUNTER, SURGEON-CAPTAIN, I.M.S.,
Plague Medical Officer.

