Report on the sanitary administration of the Punjab and proceedings of the Sanitary Board for the year ... and the report on sanitary works for.

REPORT

ON THE

SANITARY ADMINISTRATION

OF THE

PUNJAB

FOR THE YEAR 1878.

Lahore:
PRINTED AT THE CENTRAL JAIL PRESS,
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Proceedings of the Hon'ble the Lieutenant-Governor of the Punjab in the Home (Medical) Department.—
No. 633, dated 14th February 1880.

READ—

Report of the Sanitary Commissioner for the year 1878.

REMARKS.—The year 1878 was the most unhealthy since the introduction of registration eleven years ago.

The total number of deaths registered was 628,771, or 277,839 in excess of the number registered in the previous year. The deaths, as compared with the mortality of 1876, which was the highest in any former recorded year, increased under each of the heads "small-pox," "fever," "bowel complaints" and "all other causes;" but there was a marked decrease under the head of "cholera."

2. The report, as usual, shows that, although much has been effected in the way of birth and death registration, still much remains to be done. In particular, His Honor observes that the death-ratio per mille was in the Kohat District 11, and in the Jhang District 12. These figures, the Sanitary Commissioner remarks, "though they do not vitiate the result of the annual death-rate of the Province to any appreciable extent, are still in themselves simply absurd." Death ratios falling so much below the standard death-rate in districts which do not appear to be exceptionally healthy, conclusively prove defective registration. In the frontier district of Kohát, owing to the special difficulties of the case, this is no matter of surprise. The Sanitary Commissioner is under the impression that in the Jhang District no similar difficulties exist; but, as a fact, the nomad population of the district is large, and cannot easily be brought under registration.

3. At page 10 of the report a table is given which has been drawn up with a view to ascertain whether the fecundity of the population was diminished by the wide-spread sickness of 1878. Fecundity, however, is affected by causes in operation some months before a birth is recorded. The year 1877 was comparatively healthy, and it is the birth-rate rather of 1879 than that of 1878 which is likely to have been affected by the unhealthiness of the latter year.

4. In the same portion of the report the results of the registration of births and deaths in certain villages of the Western Jumna Canal within the Delhi and Karnal Districts are stated in much detail. The object, however, of the inquiry is to ascertain whether any benefit arises from the new alignment of the canal, which, it is to be hoped, will remedy the existing swampage and prevent its occurrence for the future. The new canal is not yet opened, and the statistics now collected show the sanitary condition of the villages under the old state of things. No useful comparison exhibiting the effect of the works now undertaken can be made until the new canal has been open for some years.

5. In connection with the great prevalence of small-pox during the year, the Sanitary Commissioner refers to his previous recommendations for the entertainment of permanent vaccinating establishment in the various district dispensaries. This question would be more appropriately dealt with in connection with the Vaccination Report; but it may here be mentioned that it is admitted to have been the principal defect in the vaccine operations hitherto conducted that the establishments employed in the district are fresh to the people, and are unable for some time to win their confidence. The scheme, therefore, of conducting vaccination through dispensaries under the superintendence of the Civil Surgeon by means of permanent vaccinators who would themselves be as well known to the people as the other medical assistants in the district hospitals, has been for some time under consideration, and it is hoped will be before long put into effect.

6. The most interesting portion of Dr. Bellew's report is the discussion at pages 26-27 of the causes of fevers. These he divides into three classes,—those dependent on local conditions; those dependent on climatic conditions; and those dependent on accidental conditions: but it is to the local and constant conditions, including the various circumstances which go together to constitute the sanitary condition of any particular place, that the Sanitary Commissioner's recommendations relate. He acknowledges that great improvements have been effected during the past twelve or thirteen years in the sanitary surroundings of towns, but he characterizes the measures taken within city sites as aimless and without method. He desires to see a uniform and complete system of street drainage in every town, under-ground drains being abolished and replaced by surface gutters, and he wishes that conservancy establishments of proper organization should everywhere be entertained. To these measures, where practicable, no exception can be taken; but His Honor the Lieutenant-Governor does not think the right view has been stated by the Sanitary Commissioner. The efforts in the way of sanitation made in the interior of towns and villages have not been, properly speaking, so much aimless as unsystematic. There would be little difficulty in drawing up complete plans for street drainage in various municipalities. The real practical question is, how to dispose of the refuse when it has been collected. The importance of carrying out in a more systematic way a complete plan of drainage and sewerage is not undervalued by His Honor the Lieutenant-Governor; but he thinks that far more progress has been made in constructing drains in public streets than in providing for the exit of sewage from private dwellings. There are many passages in the reports of the Sanitary Commissioner on various towns which show this to be the case. The inference is that we cannot complete any system of sewerage until the people become more alive to the importance of keeping their own dwellings and their precincts clean. District Officers and Municipal Committees cannot do this for the people. They must do it for themselves, and progress in this matter must be looked to quite as much as progress in street sewerage.

7. As regards the particular recommendation for the surface system, the Lieutenant-Governor agrees that it is much better adapted for most towns in India than the under-ground system. The subject is referred to in the latter part of the report, where the plan of a convex roadway and side-gutters is explained and illustrated. For all streets as distinguished from narrow lanes, there can be no doubt of the superiority of this plan over the old native method of a shallow groove along the middle line of the street.

8. Dr. Bellew considers that if what is recommended for the safety and well-being of the community be carried out by municipalities, it is safe to predict that the individual will quickly follow suit in adopting what is required by his personal interest. This remark appears to the Lieutenant-Governor to postulate a great deal too much, and to lose sight altogether of the point in social development at which the towns and villages of the Province stand. Nothing is more certain than that sanitary improvement is most required inside the dwelling houses of the people, but it is precisely these interiors which cannot be subjected to direct inteference on the part of Government. The Government must wait for an improvement in general intelligence before the people, who alone can do it, can carry out the necessary change; and it would be a great deal too sanguine to expect that any such elevation of the general level of intelligence can be speedily effected, or that it can be brought about by the action of Municipal Committees who may feel it incumbent to take the measures frequently pressed upon them for improving the external appearance of their towns. On the other hand, it would be a mistake to regard the people as without sanitary rules of their own. Sanitary rules, or rather observances, they certainly have, which so far as they go are not the less efficient because they are not distinct from rules of caste; but the precautions which the people of the country can ordinarily comprehend and are willing to adopt are such as are suggested by obvious physical facts which appeal to the least enlightened understanding. The characteristic of

modern sanitation is essentially that it rests upon a scientific basis. It is from scientific investigation that we learn the facts of contamination of soil, impurity of water and impurity of air, when these would ordinarily escape the observation of the senses; and it is science that proves their deleterious or deadly effects. It is precisely scientific investigation and scientific reasoning which the ordinary population of villages and towns in the Province cannot be expected to follow or appreciate. The natural scepticism about the good sense of rules for which the reasons are not fully understood or wholly believed must inevitably retard the progress of sanitary improvement, so far as it depends upon individual action. What the Sanitary Commissioner complains of is really the necessary consequence of the existing conditions of the problem. The individual alone can reform the household, and the individual cannot be forced to do so. We must be content to wait until in progress of time individuals are convinced by education.

9. In his 69th paragraph Dr. Bellew suggests that all Muncipal Committees should monopolize the whole of the sewage and street sweepings, stable litter, house garbage, &c., of their respective towns, and dispose of it by sale for the benefit of municipal funds. He subjoins a statement showing the sum which may in round numbers be annually realized by the principal municipal towns from the sale of the refuse so collected. The Lieutenant-Governor does not clearly understand how this statement has been framed. It appears that the results obtained at Amritsar have been taken as a standard for guidance; but if so, this course is misleading: special circumstances create a demand for manure there, which do not elsewhere exist.

10. The only other point which calls for notice in the report is the set of rules for the improvement of village conservancy which the Sanitary Commissioner recommends for adoption. The Lieutenant-Governor quite agrees that no such rules can or should be compulsorily enforced. Whether all that is desired can be effected by persuasion is certainly a matter of considerable doubt; but at least it is not impracticable that District Officers should take measures to secure the streets of villages being kept clean and to prevent the practice, only too common, of depositing the carcases of animals in close proximity to village walls.

11. The report is an able and an interesting one. The review of it has been much delayed by the pressure of more urgent work. Under the system which has been in force for some time, the inspection reports of the Sanitary Commissioner are forwarded to Government during the course of his tours, and such orders and remarks as may be necessary are at once communicated to the local authorities.

By order of the Hon'ble the Lieutenant-Governor,

W. M. YOUNG,

Officiating Secretary to Government, Punjab.

Printed at the Punjab Government Civil Secretariat Press, Lahore.—16-2-80—212.

SECTION I.—METEOROLOGY.

No Remarks.

(Omitted from the Report, vide Government of India No. 9—258, dated 4th September 1878, to address of Secretary to Government, Punjab).

SECTION II.—EUROPEAN ARMY.

No Remarks.

SECTION III.—NATIVE ARMY.

No Remarks.

SECTION IV.—JAILS.

No Remarks.

(Vide remarks on Section I).

SECTION V.—GENERAL POPULATION, VITAL STATISTICS.

The year under review the most unhealthy since introduction of registration system in 1868.

1. The year 1878 has been without parallel the most unhealthy since the introduction of registration in 1868. The total number of deaths registered is 628,771, which is 277,839 in excess of the number registered last year, and 131,927 in excess of the number registered in 1876. In this last year also the autumnal fevers prevailed to an abnormal extent, as will be seen by reference to the following tabular statement showing the mortality from different causes in the Province from 1868 to 1878, inclusive :—

Year.	Cholera.	Small-pox.	Fevers.	Bowel complaints.	All other causes.	Total.	Death-rate per mille of population.
1868	532	24,222	151,337	17,823	73,871	267,785	15
1869	9,258	53,169	272,946	30,953	87,495	453,821	26
1870	469	27,163	275,093	27,249	88,952	418,926	24
1871	369	25,534	213,548	21,678	102,249	363,378	21
1872	8,727	23,728	264,711	23,345	110,097	430,608	25
1873	148	25,699	219,909	19,640	91,757	357,153	20
1874	78	12,026	190,631	16,407	97,571	316,713	18
1875	6,246	13,594	279,841	27,550	119,977	447,208	26
1876	5,736	10,254	351,286	27,271	102,297	496,844	28
1877	29	12,296	219,281	17,664	101,662	350,932	20
1878	215	40,271	440,492	32,071	115,722	628,771	36

The excess of deaths in 1876 wholly under the head of fevers, which is not the case in 1878.

2. It will be seen from this table that the mortality in 1876, which was the highest registered in any year previous to the one under review, owed its increase to an excess wholly under the head of fevers. This is not the case in the returns for 1878. They show a considerable increase under each of the heads "small-pox," "fevers," "bowel complaints," and "all other causes," but a marked decrease under the head of "cholera."

Monthly per mille ratio during the year compared with the two past years.

3. The monthly ratio of mortality per mille of population for the year 1878, was as follows :—

January	...	...	23
February	...	...	20
March	...	...	22
April	...	...	23
May	...	...	33
June	...	...	30
July	...	...	23
August	...	...	24
September	...	...	39
October	...	...	73
November	...	...	74
December	...	...	47

During the first four months it ranged between 20 and 23, in the two following months it rose to between 30 and 33, and again fell to 23 and 24 in the two succeeding months. In the next month (September) commenced the usual autumnal rise, which in October and November reached the ratio of 73 and 74, and the ratio again fell in December to 47. This alternate rise and fall in the monthly mortality ratio of 1878 corresponds very closely with what was observed to occur in 1876, as will be seen by the subjoined table :—

Statement showing monthly death ratio of the Province during the years 1876, 1877, *and* 1878.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly ratio.	Remarks.
1876	21	15	15	14	16	17	16	21	49	72	49	34	28	
1877	22	18	18	16	21	23	19	17	17	20	23	25	20	
1878	23	20	22	23	33	30	23	24	39	73	74	47	36	

This subject will be noticed hereafter in section VI under the head of "fevers."

Statement showing the death-rate of each district for the years 1876, 1877, and 1878.

4. The districts in which an unusually high ratio of mortality occurred will be seen by reference to the annexed statement contrasting the death ratio per mille of population in each district for the years 1876, 1877, and 1878 :—

No.	Name of Districts.	1876.	1877.	1878.	No.	Names of Districts.	1876.	1877.	1878.
1	Delhi	24	26	55	18	Ferozepore	24	16	43
2	Gurgaon	20	19	68	19	Rawalpindi	19	21	37
3	Karnál	21	21	44	20	Jhelum	19	20	29
4	Hissar	12	12	25	21	Gujrat	22	18	29
5	Rohtak	17	18	37	22	Shahpur	23	22	30
6	Sirsa	18	16	27	23	Mooltan	30	25	28
7	Umballa	27	16	29	24	Jhang	16	13	12
8	Ludhiána	28	22	45	25	Montgomery	23	21	30
9	Simla	18	15	21	26	Muzaffargarh	24	24	31
10	Jullundur	58	24	72	27	Dera Ismail Khan ...	19	20	27
11	Hoshiárpur	50	22	38	28	Dera Gházi Khan ...	17	14	18
12	Kangra	25	20	22	29	Bannu	19	18	21
13	Amritsar	41	26	45	30	Peshawar	14	11	26
14	Gurdáspur	35	21	29	31	Hazára	17	13	25
15	Sialkot	40	17	23	32	Kohát	10	8	11
16	Lahore	35	27	46					
17	Gujránwála	43	24	34		For the Province ...	28	20	36

Districts in which a high and low death-rate occurred.

5. In eleven out of the 32 districts of the Province the ratio per mille during 1878 was 37 and upwards, and in the remaining 20 it was below that figure. The maximum ratio is 72 in the district of Jullundur, and the districts of Delhi, Gurgaon, Karnál, Ludhiána, Amritsar, Lahore, and Ferozepore show rates higher than 40 per mille. The minimum ratio is 11 in the Kohát district, and next is Jhang with a ratio of 12 per mille. In the former district in a population of 145,419 only 1571 deaths have been registered during the year, and in the latter only 4300 in a population of 348,027. These figures, though they do not vitiate the result of the annual death-rate of the Province to any appreciable extent, are still in themselves simply absurd. For even if it be allowed that these districts were abnormally healthy, (which does not by any means appear to have been the case), still their death ratios, as returned, fall considerably below that of the standard death-rate, and must therefore be due to defective registration.

Kohát and Jhang show an incredibly low death-rate

In the frontier district of Kohát, for reasons already mentioned in para. 18 of my Report for 1876, effective registration cannot at present be expected, but in the Jhang district no such difficulties exist, and I trust that the authorities concerned will devote that attention to this matter which its importance demands, and, at all events, give it more than they have hitherto done.

Suggestion for improving the system of death registration in rural circles, by the appointment of village committees.

6. The system of death registration in rural circles, though progressing slowly, is still in its infancy, and as is remarked by some district officers in their annual Sanitary Reports is "neither understood nor appreciated by the people, the ignorant class particularly." But this is no more than was to be expected, and is no reason why we should slacken our efforts to improve and extend it. What has been done towards improving death registration in the populous and important districts of Delhi, Jullundur, Umballa, &c. may also be attempted in those districts in which the people seem apathetic or indifferent to the measure. In the villages of some districts, as Karnál, Lahore, Hoshiárpur, village committees have been appointed to assist in the work of registration, and I would very strongly recommend that similar committees be appointed in the rural circles of every district of the Province. I put the recommendation forward with the more earnestness, because the registration of births, which was progressing very satisfactorily in many villages, had to be discontinued this year in rural circles owing to the inability of the Police agency, already overburdened with other duties, to devote the necessary time to the work.* And I hope that by the means of these village committees the system of birth registration may be revived in those places where it has been discontinued, and also introduced into others where it has not yet been extended.

Grounds for believing that the deaths registered, high as they are, do not represent by a good deal the full amount of loss of life in the Province during 1878.

7. In comparing the death-rates of 1878 according to districts with those of 1876 and 1877, it will be seen that in all the districts of the Province with the exception of Hoshiárpur, Kángra, Gurdáspur, Mooltan, Jhang, Gujránwála, and Siálkot, a higher rate of mortality occurred during the year under review than in the two preceding years, and also that the increase in the number of deaths was not merely confined as in 1876 to the class of diseases included under the head of "fevers," but occurred under all the other heads of death causes excepting only cholera.

High as is the figure of the registered mortality during the year under review, and well as it speaks for the improving accuracy of death registration, there is sufficient ground for the belief that

* Since the above was written, orders have been issued by the Local Government to the Police authorities to undertake this work again.

these figures do not represent by a good deal the full amount of loss of life in this Province during the year 1878. For instance, the rural death-rate in a population of 15,492,606 (census of 1868) is 33 per mille, and the town death-rate in a population,* of 1,994,519 (census 1875-76) is 58. The difference is 25. In the former registration it is known is very imperfect, owing to there being no bye-laws in force, but in the latter the registration of both births and deaths is compulsory, and consequently the above ratio of 58 per mille may be accepted as fairly accurate. The figures by themselves would give over 300,000 as the number of deaths that had escaped registration. But there are other circumstances which have to be taken into consideration before such a conclusion can be accepted. First, it is an acknowledged fact that the rural population generally is less exposed to the influence of disease causes than the town population. Next the rural population on which the above ratio has been calculated is not a reliable quantity, no enumeration having been made since 1868. And third, registration in towns is after all only fairly accurate, taking all together, so that a margin should be left for deaths that have not been registered. Allowing due weight to these considerations it is probable that from 8 to 10 per mille of deaths in the total population of the Province have escaped registration, or in other words that from about 120,000 to 150,000 deaths have occurred in excess of those registered. On the other hand, however, it must be mentioned that a large number of deaths registered in this Province occurred amongst refugees from the famine-stricken districts of Kashmír in the north, and Bikanir and Jaipur in the south, as well as from the North-West Provinces in the east. Of the exact number of these strangers dying within our limits to swell our provincial mortality, I can give no return, but reckon the number at not far short of 60 or 70 thousand.

Mortality amongst the infantile population most excessive.

8. Amongst the infantile population (See Annual Statement No. IV) the mortality has been most excessive. Out of the total of 628,771 deaths registered in the Province at different ages, no less than 245,154, or a little over one-third the whole number, occurred in children under six years of age.

The only districts in which the female deaths amongst children exceed the male are Jullundur and Hoshiárpur. In the case of Jullundur this singularity is observable in the returns of all the previous years since registration was established.

Deaths amongst children, adults and old people compared.

9. The ratio per mille of deaths registered according to age amongst the male and female population in Punjab during 1878 was as follows :—

Deaths.	*Males.*	*Females.*
Under one year.	6·15	6·48
1 year and under 6	7·48	7·99
6 years and under 12	1·89	1·92
12 „ and „ 20	1·22	1·30
20 „ and „ 30	2·08	2·39
30 „ and „ 40	2·42	2·39
40 „ and „ 50	3·30	2·72
50 „ and „ 60	3·34	2·64
60 " and upwards	8·29	7·87

These figures show very clearly the proportion of deaths amongst children, adults and old people. The total deaths registered amongst them were as follows :—

Children (From under one to under twelve years of age) ...	278,386
Adults (twelve and upwards)	155,998
Old people (fifty and upwards)	194,387

Or in the ratio of 15·9, 8·9, and 11·1 respectively per 1,000 living in a population of 17,487,125. In the whole of the Punjab then the deaths of children and old people form more than two-thirds of the entire mortality registered during the year.

Deaths registered according to classes.

10. The deaths registered according to classes are :—

Hindus	249,978
Muhammadans	322,265
Other classes	56,482

There are no data from which to calculate the ratio of deaths according to classes in the whole Province, as the necessary particulars were unreliable in the census papers of 1868, but the calculation can be made for the municipal towns which were censused in 1875-76, when these particulars were sorted. In the annexed table are given the deaths and death-rates according to classes of 48 out of the 51 principal municipal towns; the other three, Peshawar, Ludhiána and Jagraon, are omitted, these particulars not being available for them. The statement is of use as showing with some approach to accuracy the classes most affected by disease in different localities.

*NOTE.—This does not include the Hill Sanitaria and Frontier cantonments.

Statement showing the population, deaths, and ratio of deaths per 1,000 *of population according to classes in the undermentioned Municipal Towns in the Punjab during* 1878.

Number.	Districts.	Towns.	Population.	Population according to classes.			Deaths according to classes.			Ratio of deaths per 1000 of population according to classes.		
				Hindus.	Muhammadans.	Other Classes.*	Hindus.	Muhammadans.	Other Classes.*	Hindus.	Muhammadans.	Other Classes.
1	Delhi ...	Delhi ...	115,992	58,244	48,314	8,637	6,462	4,377	449	111	91	52
2		Do. Suburbs ...	44,561	20,979	18,407	5,114	1,761	1,100	61	84	60	12
3		Sonepat ...	13,637	5,521	7,261	850	132	193	17	24	26	20
4	Gurgaon ...	Farukhnagar ...	10,594	5,686	3,560	1,348	350	214	93	59	60	69
5		Rewári ...	25,190	14,413	8,517	2,253	992	535	207	69	63	92
6		Firozpur ...	10,530	4,744	4,812	971	479	489	206	101	102	212
7		Palwal ...	13,553	6,641	4,465	2,443	1,128	782	384	170	175	157
8	Karnál ...	Karnál ...	24,015	12,855	8,174	2,984	772	531	301	60	65	101
9		Kaithal ...	15,799	8,549	6,495	749	427	343	33	50	53	44
10		Pánipat ...	24,500	6,455	16,459	1,586	238	597	81	37	36	51
11	Hissar ...	Hissar ...	14,162	7,579	5,064	1,451	628	315	201	83	62	138
12		Hánsi ...	12,210	5,660	5,140	1,410	344	327	75	61	64	53
13		Bhiwáni ...	33,220	26,655	3,351	3,212	1,147	147	191	43	44	59
14	Rohtak ...	Rohtak ...	14,994	6,560	6,570	1,832	477	335	33	73	51	18
15		Jhajjar ...	12,456	6,323	5,019	1,114	249	168	15	39	33	13
16	Sirsa ..	Sirsa ...	12,807	8,047	3,634	1,106	609	235	130	76	65	117
17	Umballa ...	Umballa ...	26,258	9,452	14,930	1,792	553	828	139	58	55	77
18		Jagádhri ...	12,522	9,054	2,476	984	272	100	32	30	40	32
19		Shahabad ...	11,660	4,272	6,698	681	145	201	22	34	30	38
20		Sadhaura ...	11,167	4,265	6,080	822	144	218	31	34	36	32
21		Rúpar ...	10,261	4,723	4,874	660	109	119	20	23	24	30
22	Jullundur ...	Jullundur ...	35,222	11,320	23,229	670	1,027	2,177	96	91	94	143
23		Do. Suburbs ...	15,702	4,419	10,603	618	472	1,164	49	107	110	79
24		Kartárpur ...	11,053	5,794	3,566	1,693	172	158	87	30	44	51
25		Ráhon ...	12,914	5,831	6,323	760	265	271	36	45	43	47
26	Hoshiárpur ...	Hoshiárpur ...	13,138	6,396	6,139	561	369	356	39	58	58	69
27		Tanda & Urmar ...	13,971	5,156	8,329	486	214	369	14	41	44	29
28	Amritsar ...	Amritsar ...	136,166	66,093	66,353	3,642	3,557	5,817	384	54	88	105
29	Gurdáspur ...	Batála ...	26,929	9,420	16,579	924	188	429	26	20	26	28
30	Siálkot ...	Siálkot ...	32,989	8,851	23,613	516	186	704	43	21	30	83
31	Lahore ...	Lahore ...	92,035	34,190	55,440	2,352	1,672	3,501	128	49	63	54
32		Do. Suburbs ...	36,406	6,316	23,396	4,929	229	1,086	100	36	46	20
33		Kasur ...	16,793	3,292	12,968	529	143	412	6	43	32	11
34	Gujránwála ...	Gujránwála ...	20,362	9,557	9,894	860	365	550	30	38	56	35
35		Wazirabad ...	15,346	4,985	9,873	477	109	204	2	22	21	4
36	Ferozepore ...	Ferozepore ...	15,168	7,750	6,986	413	636	666	34	82	95	82
37	Rawalpindi ...	Rawalpindi ...	20,802	9,341	11,115	307	690	1,181	66	74	106	215
38	Jhelum ...	P. D. Khan ...	15,397	6,606	8,780	.	465	506	..	70	58	...
39	Gujrat ...	Gujrat ...	17,401	4,641	12,571	174	108	523	7	23	42	40
40		Jalálpur ...	14,014	3,572	10,442	...	194	555	8	54	53	...
41	Shahpur ...	Bhera ...	14,710	6,032	8,520	151	369	414	4	61	48	26
42	Mooltan ...	Mooltan ...	29,448	18,528	10,910	1	768	473	2	41	43	...
43		Do. Suburbs ...	21,430	3,400	17,380	515	187	877	38	55	50	74
44	Jhang ...	Maghiána ...	13,618	6,354	7,117	91	238	221	3	45	31	33
45		Chiniot ...	11,999	3,771	7,956	272	172	173	5	46	22	18
46	D. I. Khan ...	D. I. Khan ...	19,954	8,308	11,603	28	539	592	2	65	51	71
47	D. G. Khan ...	D. G. Khan ...	19,133	8,954	10,092	76	447	609	4	50	60	53
48	Kohát ...	Kohát ...	11,043	1,430	9,545	68	39	165	7	27	17	103
		Grand Total ...	1,173,231	506,984	599,622	53,112	31,288	36,307	4,041	62	60	76

* *Note.*—Europeans, Eurasians, and Native Christians are not included in these columns.

Localities in which the deaths amongst the Muhammadan exceeded the Hindu population, and *vice versa*.

11. The total Hindu population in these 48 towns is 506,984, and the Muhammadan 599,622, and the deaths registered amongst them were 31,288 and 36,307 respectively, which give a death-rate of 62 per mille in the former and 60 in the latter, thus showing but a slight difference in the death-rate of the two classes forming the bulk of the town population. The towns in which the Muhammadan death-rate exceeded that of the Hindu in any marked degree were—

Jagádhri	10 per mille above the Hindu.	Gujránwála	18 per mille above the Hindu.
Kartárpur	14 " " "	Ferozepore	13 " " "
Amritsar	34 " " "	Rawalpindi	32 " " "
Siálkot	9 " " "	Gujrat	9 " " "
Lahore	14 " " "	D. G. Khan	10 " " "
Do. Suburbs	10 " " "		

Those towns in which the Hindu death-rate exceeded the Muhammadan in any marked degree are :—

Delhi		20	per mille	above the	Muhammadan.	Pind Dádan Khan	12	per mille above the Muhammadan
Do.	suburbs	24	,,	,,		Bhera	13	,, ,, ,,
Hissar	,,	21	,,	,,		Maghiána	14	,, ,, ,,
Rohtak	,,	22	,,	,,		Chiniot	24	,, ,, ,,
Sirsa	,,	11	,,	,,		Dera Ismail Khan	14	,, ,, ,,
Kasur	,,	11	,,	,,		Kohát	10	,, ,, ,,

In the remaining towns the difference is not so marked. I can offer no satisfactory explanation of these remarkable differences, though doubtless registration has something to do with it.

Rate at which the mortality occurred in some of the municipal towns during the weeks of Sept. Oct. and Novr. most appalling.

12. The rate at which deaths occurred in many of the municipal towns during the weeks of September, October and November in 1878 (the fever months) was most appalling, as will be seen from the subjoined statement:—

Number.	Towns.	Population.	Death-rate per mille of population per annum for the weeks ending 7th September	14th do.	21st do.	28th do.	5th October.	12th do.	19th do.	26th do.	2nd November.	9th do.	16th do.	23rd do.	30th do.
1	Delhi ...	115,992	76	111	151	159	172	217	249	262	290	264	283	230	192
2	Do. Suburbs ...	44,561	66	55	89	90	112	127	149	135	181	161	131	150	121
3	Sonepat ...	13,637	53	34	19	30	42	27	34	27	42	42	23	23	23
4	Farukhnagar ...	10,594	167	157	64	113	142	83	98	59	93	93	69	24	59
5	Rewári ...	25,190	111	122	120	134	107	120	132	64	99	93	107	58	56
6	Firozpur ...	10,550	188	168	173	173	168	163	123	192	138	99	123	123	44
7	Palwal ...	13,553	169	318	338	291	380	518	560	549	579	506	483	395	487
8	Karnál ...	24,015	39	58	76	102	108	141	95	154	136	141	121	115	106
9	Kaithal ...	15,799	26	39	49	39	30	43	62	155	276	174	188	141	105
10	Pánipat ...	24,500	40	27	42	28	40	70	42	55	57	51	40	51	57
11	Hissar ...	14,162	70	40	103	198	195	235	217	187	147	117	106	161	81
12	Hánsi ...	12,210	17	68	38	98	140	136	255	162	153	153	136	102	119
13	Bhiwáni ...	33,220	50	67	56	97	122	105	86	70	80	94	75	52	47
14	Rohtak ...	14,994	55	35	76	66	121	128	187	180	288	246	225	104	121
15	Jhajjar ...	12,456	21	42	33	29	79	58	75	54	88	58	83	33	63
16	Sirsa ...	12,807	20	57	61	207	174	203	162	187	244	166	142	158	77
17	Umballa ...	26,258	51	61	61	65	111	77	115	113	131	119	99	95	113
18	Jagádhri ...	12,522	29	33	50	37	54	70	79	75	58	46	79	54	29
19	Shahabad ...	11,660	13	36	31	31	31	62	40	31	67	62	27	76	44
20	Sadhaura ...	11,167	46	32	19	51	23	51	60	79	37	88	51	19	70
21	Rúpar ...	10,261	40	25	30	30	25	46	10	56	15	46	101	30	81
22	Ludhiána ...	40,385	67	86	131	175	230	245	291	295	475	429	394	359	288
23	Jagraon ...	16,321	64	70	115	156	143	150	175	131	162	194	150	102	134
24	Jullundur ...	35,222	52	84	108	155	350	508	444	366	384	276	248	218	208
25	Do. Suburbs ...	15,702	179	175	404	404	454	447	500	414	315	262	202	179	142
26	Kartárpur ...	11,053	28	38	56	75	85	127	127	89	108	122	85	85	94
27	Ráhon ...	12,914	52	72	72	88	97	149	80	145	121	149	105	117	68
28	Hoshiárpur ...	13,138	32	63	75	115	83	154	174	158	111	182	150	131	59
29	Tánda and Urmar ...	13,971	45	48	45	56	71	112	100	97	93	93	71	56	52
30	Amritsar ...	136,166	51	55	84	96	116	146	139	158	146	162	161	138	153
31	Batála ...	26,929	35	31	29	40	42	35	64	39	35	37	33	29	11
32	Siálkot ...	32,989	46	24	24	47	47	31	47	39	35	52	35	44	49
33	Lahore ...	92,035	46	60	67	89	85	108	119	104	102	99	101	104	78
34	Do. Suburbs ...	36,406	27	41	61	71	66	76	56	73	94	90	101	83	78
35	Kasur ...	16,793	43	40	53	77	84	74	74	34	111	62	84	43	43
36	Gujránwála ...	20,362	43	48	43	74	46	102	110	84	89	69	69	107	92
37	Wazirabad ...	15,346	27	24	17	13	17	20	30	24	30	13	44	24	24
38	Ferozepore ...	15,168	134	185	339	356	308	223	137	195	212	151	116	120	123
39	Rawalpindi ...	20,802	115	77	107	112	100	110	165	220	220	185	207	200	192
40	Pind Dádan Khan ...	15,397	91	135	148	179	132	182	121	162	186	155	142	125	111
41	Gujrat ...	17,401	15	42	39	30	45	42	164	54	66	42	60	78	48
42	Jalálpur ...	14,014	70	22	63	48	70	48	70	78	96	78	82	85	152
43	Bhera ...	14,710	46	67	56	106	85	120	113	124	124	113	67	81	71
44	Mooltan ...	29,448	53	37	56	63	46	51	44	62	67	81	69	71	69
45	Do. Suburbs ...	21,430	58	65	85	58	97	95	82	97	78	109	90	63	119
46	Maghiána ...	13,618	34	27	19	42	34	30	53	15	42	59	27	69	172
47	Chiniot ...	11,999	35	48	35	22	22	17	30	26	26	30	22	26	48
48	Dera Ismail Khan ...	19,954	29	52	73	78	73	104	57	138	216	242	263	271	159
49	Dera Gházi Khan ...	19,133	27	65	41	92	73	144	133	155	201	163	144	114	109
50	Pesháwar ...	58,430	69	55	87	122	144	184	225	268	309	286	318	263	221
51	Kohát ...	11,043	14	23	5	23	113	28	14	38	19	38	28	38	47

Statement showing birth and death-rates of all municipal towns.

13. In the following tabular statement are shown the birth and death-rates of all the municipal towns, 197 in number, for the year under review.

No.	Districts.	Municipality.	Population, census 1875-76.	Birth-Rate per 1000 of population.	Death-Rate per 1000 of population.	Remarks.
1	Delhi	Delhi	115,992	40	97	
2		Do. Suburbs	44,561	43	66	
3		Najafgarh	4,309	43	50	
4		Sonepat	13,637	31	25	
5		Ballabgarh	6,671	38	78	
6		Faridabad	7,583	41	114	
7	Gurgaon	Farukhnagar	10,594	37	62	
8		Rewári	25,190	34	69	
9		Firozpur	10,530	31	111	
10		Palwal	13,553	39	169	
11	Karnal	Karnál	24,015	36	67	
12		Kunjpura	5,049	45	67	
13		Pùndri	5,433	18	47	
14		Kaithal	15,799	22	51	
15		Pánipat	24,500	38	37	
16	Hissar	Hissar	14,162	27	81	
17		Hánsi	12,210	22	61	
18		Bhiwáni	33,220	35	45	
19		Fatahabad	3,084	30	54	
20		Rattia	3,120	19	23	
21		Tohána	3,445	38	35	
22	Rohtak	Rohtak	14,994	28	56	
23		Beri	9,205	41	69	
24		Gohána	7,296	31	70	
25		Kharkhauda	4,185	38	62	
26		Bahádurgarh	7,127	37	54	
27		Jhajjar	12,456	24	35	
28	Sirsa	Sirsa	12,807	31	76	
29		Rània	4,917	25	25	
30		Ellendabad	3,299	30	41	
31		Rori	2,728	29	39	
32		Fázilka	4,346	18	22	
33	Umballa	Umballa	26,258	35	58	
34		Jagádhri	12,522	26	32	
35		Bùriya	8,197	27	50	
36		Ládwa	4,121	29	24	
37		Pihowa	3,569	31	67	
38		Shahabad	11,660	20	31	
39		Thánesar	7,111	26	105	
40		Rádaur	4,098	26	27	
41		Sadhaura	11,167	29	35	
42		Kharar	4,847	30	46	
43		Rúpar	10,261	26	24	
44	Ludhiana	Ludhiána	40,385	42	111	
45		Raekot	8,262	52	67	
46		Jagraon	16,321	39	68	
47		Khanna	3,660	40	47	
48		Máchiwára	6,224	43	57	
49		Bilolpur	3,059	39	64	
50	Jullundur	Jullundur	35,222	50	94	
51		Do. Suburbs	15,702	47	107	
52		A'dampur	4,153	31	55	
53		Aláwalpur	4,836	26	58	
54		Kartárpur	11,053	28	38	
55		Bunga	4,817	36	69	
56		Ráhon	12,914	40	44	
57		Nawashahr	5,351	33	91	
58		Phillour	6,251	32	55	
59		Núrmahal	9,025	31	58	
60		Nakodar	9,780	26	145	
61		Mahatpur	6,853	36	117	

No.	Districts.	Municipality.	Population, census 1875-76.	Birth-Rate per 1000 of population.	Death-Rate per 1000 of population.	Remarks.
62	Hoshiarpur	Hoshiárpur	13,138	42	58	
63		Do. Suburbs	8,178	45	55	
64		Hariàna	7,802	40	53	
65		Garhdiwàla	3,874	40	35	
66		Dasúya	8,675	27	43	
67		Urmar Tánda	13,971	31	43	
68		Miáni	7,993	36	39	
69		Mukerián	5,125	30	30	
70		Una	4,908	19	17	
71		Nandpur	6,405	25	29	
72	Kangra	Kángra	6,336	27	26	
73		Tira Sujánpur	3,393	36	32	
74		Haripur	3,842	23	32	
75		Jawalámukhi	2,844	30	40	
76		Núrpur	7,337	25	44	
77	Amritsar	Amritsar	1,36,166	42	72	
78		Do. Suburbs	6,215	...	17	
79		Majitha	6,004	28	19	
80		Jandiála	7,037	30	56	
81		Rámdás	5,257	17	20	
82		Tarn Tárn Khas ...	3,133	39	80	
83		Variowal	5,958	32	64	
84	Gurdaspur	Gurdáspur	4,137	19	31	
85		Dínanagar	6,626	33	32	
86		Bahrámpur	3,477	31	28	
87		Kalánaur	6,051	33	37	
88		Pathánkot	4,507	26	55	
89		Sujánpur	6,557	31	34	
90		Narot	3,944	25	56	
91		Shahpur	1,336	37	37	
92		Sukhuchak	3,246	20	19	
93		Darman	1,607	19	25	
94		Kot Naina	1,726	25	45	
95		Batála	26,929	32	24	
96		Srigovindpur	5,531	32	40	
97		Fatahgarh	4,481	41	27	
98		Dera Nanak	7,212	34	57	
99	Sialkot	Siálkot	32,989	30	28	
100		Daska	5,401	24	19	
101		Jámki	4,359	29	28	
102		Mitránwála	3,095	44	23	
103		Kila Sobha Singh... ...	5,159	29	32	
104		Pasrúr	8,276	26	25	
105		Zafarwál	4,975	23	20	
106		Sankhatra	2,390	45	30	
107		Nárowál	5,297	36	30	
108	Lahore	Lahore	92,035	39	57	
109		Do Suburbs	36,406	13	39	
110		Sharakpur	4,425	45	34	
111		Chunián	6,469	53	35	
112		Khudián	3,322	44	50	
113		Kasur	16,793	26	33	
114		Khem Karn	5,860	34	61	
115		Patti	6,290	36	65	
116	Gujranwala	Gujránwála	20,362	40	46	
117		Eminabad	6,719	34	38	
118		Kila Didár Singh	2,214	38	42	
119		Wazirabad	15,346	34	20	
120		Sohdra	4,716	35	16	
121		Akálgarh	5,037	39	33	
122		Rámnagar	7,180	28	25	
123		Háfizabad	2,299	50	41	
124		Jalálpur	2,572	36	57	
125		Pindi Bhatián	4,188	32	23	

No.	Districts.	Municipality.	Population, census 1875-76.	Birth-Rate per 1000 of population.	Death Rate per 1000 of population.	Remarks.
126	Ferozepore ...	Ferozepore	15,168	50	88	
127		Zíra	3,471	36	92	
128		Fatahgarh	1,654	54	139	
129		Makhu	1,713	40	53	
130		Dharmkot	5,467	45	78	
131		Kot Isa Khan	1,520	36	124	
132		Muktsar	2,983	44	44	
133	Rawalpindi ...	Rawalpindi	20,802	38	93	
134		Pindigheb	8,223	41	29	
135		Makhad	4,252	34	49	
136		Hazro	7,950	44	48	
137		Attok and Maláhi Tola. ...	3,213	40	76	
138	Jhelum ...	Jhelum	7,947	16	64	
139		Chakwál	5,674	26	33	
140		Talagang	5,659	24	20	
141		Pind Dádan Khan ...	15,397	40	63	
142	Gujrat ...	Gujrat	17,401	42	37	
143		Jalálpur	14,014	36	54	
144		Kunjáh	5,355	31	30	
145		Dinga	5,086	38	35	
146	Shahpur ...	Shahpur	4,743	61	61	
147		Sahiwál	8,634	52	50	
148		Ghirot	2,799	29	18	
149		Bhera	14,710	52	53	
150		Miáni	6,158	52	57	
151		Kusháb	8,344	49	47	
152	Mooltan ...	Mooltan	29,448	48	42	
153		Do. Suburbs ...	21,430	44	51	
154		Shujabad	6,280	32	47	
155		Jalálpur	3,525	47	46	
156		Karor	4,650	35	44	
157		Dunyapur	2,054	42	43	
158		Talamba	1,948	47	46	
159	Jhang ...	Jhang	8,609	27	22	
160		Maghiána	13,618	30	37	
161		Shorkot	2,478	46	31	
162		Ahmadpur	2,146	44	67	
163		Chiniot	11,999	38	29	
164	Montgomery ...	Montgomery	2,588	21	22	
165		Kamália	5,900	36	41	
166		Pákpattan	5,723	31	49	
167		Sayadwála	3,437	42	47	
168		Dipálpur	3,407	42	66	
169	Muzaffargarh ...	Muzaffargarh	2,537	48	55	
170		Khangarh	2,802	25	51	
171		Shahr Sultán	2,836	35	23	
172		Jatoi	4,814	15	21	
173		Alipur	2,282	49	56	
174		Setpur	1,753	41	39	
175		Khairpur	2,562	47	49	
176	Dera Ismail Khan	Dera Ismail Khan ...	19,954	28	57	
177		Kulachi	7,856	34	21	
178		Bhakkar	4,799	11	21	
179		Tánk	3,186	15	33	
180		Leiah	5,689	16	16	
181		Karor	2,766	36	44	
182	Dera Ghazi Khan	Dera Gházi Khan	19,133	36	55	
183		Jámpur	4,209	41	59	
184		Dájal	5,016	38	58	
185		Rájanpur	3,548	35	32	
186		Kot Mithn	3,347	41	41	

No.	Districts.	Municipality	Population, census 1875-76.	Birth-Rate per 1000 of population.	Death-Rate per 1000 of population.	Remarks.
187	Bannu ...	Edwardes-abad	3,896	35	43	
188		Isa Khel	6,541	35	75	
189		Kálabágh	6,082	25	34	
190		Laki	4,406	36	35	
191	Peshawar ...	Peshâwar	58,430	41	96	
192		Shankargarh	1,017	53	65	
193	Hazara ...	Abbott-abad	1,194	8	100	
194		Nawashahr	3,445	36	56	
195		Baffa	4,494	23	54	
196		Haripur	4,477	29	48	
197	Kohat ...	Kohát	11,043	10	19	
		Total ...	19,94,519	36	58	

14. From an analysis of this statement it appears that with the exception of the 26 towns named on the margin, the death-rate in all the others exceeded 25 per mille; and the birth-rate, in 98 out of a total of 197 towns, 35 per mille. This is satisfactory, and clearly shows that the system of registration in municipal towns is steadily improving.

System of registration in municipal towns steadily improving.

1. Rattia
2. Fázilka
3. Ládwa
4. Rúpar
5. Una
6. Amritsar Suburbs
7. Majítha
8. Rámdas
9. Sukhuchak
10. Batála
11. Daska
12. Mitranwala
13. Zafarwál
14. Wazirabad
15. Sohdra
16. Pindi Bhatiàn
17. Talagang
18. Ghirot
19. Jhang
20. Montgomery
21. Shahr Sultán
22. Jotoi
23. Kulâchi
24. Bhukkar
25. Leiah
26. Kohát

Percentage of male to female births.

The percentage of male to female births was in the ratio of 111·6, males to every 100 females against 111·7 in the previous year.

15. With the view to ascertain whether the fecundity of the population has been diminished and if so, to what extent, by the wide-spread sickness of the year under review, I subjoin a statement showing the birth and death-rates of those towns which were notoriously unhealthy, and which show a death-rate of 70 per mille and upwards.

The question whether the wide-spread sickness has diminished the fecundity of the population.

District.	Towns.	*Birth-rate.*			*Death-rate.*		
		1876.	1877.	1878.	1876.	1877.	1878.
Delhi ...	Delhi ...	50	53	40	42	52	97
	Ballabgarh ...	41	43	38	30	32	78
	Faridabad ...	48	57	41	33	40	114
Gurgaon ...	Firozpur ...	61	49	31	33	42	111
	Palwal ...	50	56	39	47	36	169
Hissar ...	Hissar ...	35	30	27	36	34	81
Sirsa ...	Sirsa ...	33	31	31	29	27	76
Umballa ...	Thánesar ...	25	29	26	42	28	105
Ludhiana ...	Ludhiána ...	45	43	42	45	36	111
Jullunudr ...	Jullundur ...	38	28	50	138	24	94
	Do Suburbs ...	41	28	47	112	26	107
	Nakodar ...	27	15	26	51	17	145
	Mahitpur ...	31	23	36	47	23	117
Amritsar ...	Amritsar ...	38	34	42	71	41	72
Ferozepore ...	Ferozepore ...	30	26	50	86	33	88
	Zira ...	29	19	36	126	30	92
	Fatahgarh ...	40	36	54	61	31	139
	Dharmkot ...	47	48	45	54	34	78
	Kot Isa Khan ...	37	28	36	107	27	124
Rawalpindi ...	Rawalpindi ...	37	34	38	44	39	93
	Attock ...	41	40	40	32	25	76
Peshawar ...	Peshâwar ...	44	42	41	35	34	96
Hazara ...	Abbott-abad ...	23	17	8	8	9	100

The towns of Hissar, Nakodar, Thánesar and Abbottabad show a very low birth-rate. But that I should attribute to imperfect registration rather than to excessive sickness. For the rest the figures do not show much difference from the birth-rate of these same towns during the two preceding years, the figures of which are given for comparison.

Result of registration in the villages in the Western Jumna Canal in the Delhi and Karnal districts.

16. In execution of the orders of the Secretary of State for India, communicated to the Government of India in Despatch No. 81 dated London, 12th August 1875, for obtaining a reliable record of the results on the health of the neighbouring population by the works which have been sanctioned and are in progress for the improvement of the Western Jumna canal, I append herewith a statement showing the births and deaths in the 48 villages situated on the canal (25 in the Delhi and 23 in the Karnal district) during the half year ending December 1878. The return has been compiled from the weekly reports submitted to this office.

Statement showing Births and Deaths registered in the villages situated on the Western Jumna

Number.	District.	Name of Villages.	Population according to Census of 1877.			Total No. of Births Registered.			Total No. of Deaths Registered.			Birth-rate per mille of population per annum.	Death-rate per mille of population per annum.	Causes of Death.					
			Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.			Cholera.	Small-pox	Fevers.	Bowel complaints.	Injuries.	All other causes.
1	DELHI.	Tájpur (Tihári Khurd) ...	214	205	419	7	5	12	13	15	28	57	134	...	...	26	...	...	2
2		Bhatgaon	2,396	2,046	4,442	70	58	128	153	154	307	57	138	...	...	256	16	2	33
3		Barawasni	988	907	1,895	32	19	51	49	53	102	54	108	...	...	84	1	2	15
4		Mahra	873	773	1,646	27	19	46	73	55	128	56	155	...	...	100	3	...	25
5		Dabarpur	253	203	456	9	8	17	14	11	25	74	110	...	...	17	...	...	8
6		Hulaheri	478	416	894	11	8	19	25	24	49	42	110	...	...	45	...	..	4
7		Garhi Brahmnán ...	277	268	545	3	6	9	7	5	12	33	44	...	...	11	...	...	1
8		Bádshahpur Májri ...	196	181	377	9	6	15	11	12	23	79	122	...	...	19	...	...	4
9		Jáji	296	285	581	10	10	20	19	30	49	69	169	...	...	34	8	1	6
10		Kakrohi	1,089	1,020	2,109	38	37	75	72	53	125	71	119	...	...	110	...	...	15
11		Juan	1,563	1,476	3,039	41	32	73	92	70	162	48	107	...	...	137	1	1	23
12		Sitauli	432	403	835	7	4	11	28	28	56	26	134	...	..	45	...	1	10
13		Chitánah	442	393	835	6	7	13	33	27	60	31	144	...	...	51	4	..	5
14		Kheri Darya	332	304	636	10	4	14	15	12	27	44	85	...	...	20	1	...	6
15		Jafarabad	249	227	476	6	3	9	22	10	32	39	134	...	...	28	...	..	4
16		Khizarpur Ját ...	218	191	409	4	1	5	12	11	23	24	112	...	..	23	...	...	...
17		Maihlána	614	537	1,151	21	20	41	31	36	67	71	116	...	...	59	...	...	8
18		Kareori	403	353	756	9	10	19	20	25	45	50	119	...	...	22	...	...	23
19		Hassanyárpur (Tihári Kalan)	217	188	405	5	6	11	15	22	37	54	183	...	...	33	...	...	4
20		Bágru	381	322	703	8	3	11	13	9	22	31	62	...	...	19	...	...	3
21		Jharauti	261	253	514	5	11	16	13	15	28	62	109	...	...	24	...	...	4
22		Anandpur	151	136	287	3	4	7	8	9	17	49	118	...	...	13	...	..	4
23		Bhadhánah	648	585	1,233	21	26	47	28	35	63	76	102	...	...	50	...	...	13
24		Jharaut	318	261	579	11	7	18	14	16	30	62	104	...	...	22	...	...	8
25		Rohát	1,468	1,293	2,761	38	43	81	72	86	158	59	114	...	1	115	10	...	32
		Total ...	14,757	13,226	27,983	411	357	768	852	823	1,675	55	120	...	1	1,363	44	7	260
1	KARNAL.	Kharkali	72	50	122	1	2	3	2	2	4	49	65	...	...	1	...	1	2
2		Jhiwarheri	187	160	347	7	9	16	11	10	21	92	121	...	3	6	2	...	10
3		Hassanpur	207	190	397	10	7	17	4	6	10	86	50	...	...	10	...	...	...
4		Rasin	222	199	421	3	7	10	9	12	21	47	100	...	3	9	2	...	5
5		Phorlak	684	700	1,384	19	8	27	17	25	42	39	61	...	3	33	...	1	5
6		Opli	36	44	80	...	...	...	1	...	1	...	25	...	...	1	...	...	...
7		Garaundah	2,061	1,568	3,629	22	21	43	55	36	91	24	50	...	17	60	1	...	13
8		Malakpur	89	63	152	2	1	3	2	...	2	39	26	...	1	1	...	...	...
9		Bádshahpur	31	20	51	3	...	3	...	...	...	118	...	...	...	...	...	...	...
10		Ghorra Gharri ...	89	75	164	1	3	4	...	1	1	49	12	...	...	1	...	...	...
11		Sheikhpura	395	379	774	18	8	26	7	6	13	67	33	...	..	11	...	...	2
12		Godah	627	551	1,178	15	5	20	7	6	13	34	22	...	...	11	...	...	2
13		Kohand	651	501	1,152	11	7	18	10	9	19	31	33	...	...	19	...	...	...
14		Ganjar	311	249	560	6	1	7	11	7	18	25	64	...	3	13	...	...	2
15		Barauli	406	361	767	9	6	15	11	5	16	39	42	..	...	16	...	...	...
16		Babárpur	202	183	385	3	...	3	8	8	16	15	83	...	...	13	1	...	2
17		Begampur	127	122	249	2	3	5	10	5	15	40	120	...	1	13	...	...	1
18		Dolánah	494	438	932	8	7	15	19	16	35	32	75	...	7	23	...	...	5
19		Kotánah	40	27	67	1	2	3	2	1	3	89	89	...	...	2	1	...	...
20		Baholi	363	235	598	9	7	16	23	11	34	53	114	...	3	20	..	1	10
21		Razapur	88	35	123	...	...	...	1	...	1	...	16	...	...	1	...	...	...
22		Khacroli	532	458	990	1	3	4	15	11	26	8	52	...	...	24	..	...	2
23		Muhammadpur ...	340	291	631	9	7	16	22	12	34	51	108	...	...	30	...	...	4
		Total ...	8,254	6,899	15,153	160	114	274	247	189	436	36	57	...	43	318	7	3	65

Canal in the Delhi and Karnál Districts during the half-year ending in December 1878.

9																10						11
AGES AT DEATH.																DEATHS BY MONTHS.						
Under 1 year.		*1 year and under 6.*		*6 and under 12.*		*12 and under 20.*		*20 and under 30.*		*30 and under 40.*		*40 and under 50.*		*50 and under 60.*		*60 and upwards.*								
Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	July.	August.	September.	October.	November.	December.	Number.
4	7	3	1	..	...	1	..	...	...	1	1	1	2	...	...	3	4	...	1	...	9	12	6	1
46	43	37	37	2	3	13	2	6	26	5	4	21	13	9	10	14	16	14	22	40	114	81	36	2
11	15	9	10	2	2	3	3	4	2	1	5	7	5	5	3	7	8	8	7	6	25	38	18	3
11	7	26	18	5	4	4	2	4	4	5	10	1	3	8	3	9	4	9	11	11	42	40	15	4
6	5	3	1	1	...	...	1	1	...	1	1	1	1	...	1	1	1	...	...	1	10	8	6	5
5	7	6	5	1	2	...	...	1	..	1	1	2	1	3	...	6	8	3	2	8	10	22	4	6
...	2	3	..	...	...	...	1	1	...	...	...	1	...	1	1	1	1	...	1	...	6	4	1	7
3	3	2	3	...	1	...	...	2	...	1	...	2	...	...	3	1	2	4	1	2	7	4	5	8
5	11	2	2	..	...	1	1	3	3	1	2	3	1	..	1	4	9	5	4	6	17	11	6	9
14	12	20	13	1	4	1	2	4	6	3	3	9	3	9	2	11	8	4	13	15	30	39	24	10
20	8	26	15	2	2	1	2	4	7	5	6	13	7	6	9	15	14	5	12	13	35	57	40	11
12	7	6	8	1	2	1	...	...	...	...	1	2	1	4	3	2	6	1	3	8	21	11	12	12
10	3	7	11	1	...	1	...	1	1	4	2	...	2	4	3	5	5	1	1	8	21	17	12	13
6	1	3	3	...	...	1	1	...	1	1	1	2	2	1	1	1	2	3	4	...	7	10	3	14
7	5	4	4	1	...	1	...	1	...	3	...	2	...	...	...	3	1	2	1	...	18	10	1	15
3	2	1	2	...	1	...	...	1	1	1	1	3	2	1	...	2	2	...	4	2	10	...	7	16
10	7	10	12	1	1	...	...	...	1	2	4	3	3	3	3	2	5	2	6	6	20	20	13	17
9	11	...	5	...	1	1	...	2	2	2	..	3	2	1	4	2	...	9	1	1	13	12	7	18
5	11	1	2	...	1	1	...	1	2	2	1	3	2	1	3	1	1	2	...	7	10	11	7	19
2	2	1	...	...	1	1	...	1	...	...	1	...	2	5	1	3	2	2	1	2	6	9	2	20
6	5	...	2	...	...	1	...	1	1	1	3	1	...	...	1	3	3	...	2	4	5	11	6	21
1	3	2	2	...	...	1	...	1	...	...	...	..	1	2	3	1	...	1	...	...	5	7	4	22
8	12	7	6	...	1	1	...	1	4	2	5	2	4	4	2	3	1	3	6	6	19	23	6	23
5	4	4	2	...	...	1	2	...	5	...	2	...	...	3	1	1	...	4	4	2	10	6	4	24
20	25	11	20	3	...	1	3	3	4	6	9	10	6	4	7	14	12	5	16	17	40	50	24	25
229	218	194	184	21	26	36	20	43	70	48	63	92	63	74	64	115	115	87	123	165	518	513	269	
1	1	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	1	1
4	1	4	7	...	1	..	...	..	...	...	1	...	...	...	...	3	...	3	1	5	2	7	3	2
...	...	1	...	...	...	...	...	...	2	...	1	1	2	2	1	...	...	...	...	2	1	6	1	3
4	2	1	5	...	...	...	1	...	1	1	...	2	1	1	...	...	2	...	5	3	1	3	7	4
4	4	4	11	...	1	1	1	2	1	2	1	1	1	1	1	2	4	3	2	5	4	19	9	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	..	...	...	1	...	6
18	5	11	9	4	2	...	...	...	...	3	1	2	2	3	1	14	16	14	14	10	21	23	9	7
...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	1	...	...	1	...	8
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	10
2	...	2	...	...	...	...	1	1	...	1	2	...	1	...	...	1	2	...	...	5	4	3	1	11
1	...	...	2	1	...	..	...	...	2	1	...	2	...	...	1	2	1	...	1	3	4	2	3	12
2	1	...	1	...	...	...	...	1	1	1	...	2	...	2	1	2	5	4	..	5	2	5	3	13
3	2	5	1	2	...	...	...	...	...	...	...	1	...	...	2	...	2	5	...	2	2	1	8	14
...	...	2	1	...	...	1	...	1	...	2	...	2	...	3	1	...	3	...	2	2	2	8	2	15
3	2	3	3	...	...	...	...	...	...	...	1	1	1	...	..	1	1	...	1	4	3	6	2	16
2	3	2	...	1	...	...	...	...	1	2	1	2	...	1	...	...	...	...	1	2	2	8	2	17
4	...	4	5	...	..	1	1	1	3	1	2	2	3	4	1	2	1	5	4	2	5	11	8	18
...	...	...	...	...	...	...	...	...	1	1	..	...	...	...	...	1	...	...	1	1	...	1	...	19
8	3	4	1	4	...	...	...	...	1	2	1	2	2	...	1	3	2	6	1	5	7	11	4	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	1	...	...	...	...	...	1	...	21
1	3	5	2	...	...	...	...	3	1	...	...	2	...	...	...	4	5	1	4	1	4	12	4	22
4	2	10	5	...	...	2	...	1	1	...	1	4	...	...	1	1	2	2	2	4	7	18	1	23
61	29	59	53	12	4	6	5	10	15	17	12	27	13	18	11	37	47	43	41	61	75	148	68	

17. Registration in these villages commenced in April 1878, and was carried on through the agency of the village watchmen under a special plan of supervision, and will have to be continued for some years before any definite opinion can be formed as to the effect of canal irrigation upon the health of the people inhabiting the villages in close proximity to it.

Registration will have to be continued in the selected areas for some years before any opinion can be formed.

18. It is evident, however, from the annexed statement showing the number of births and deaths registered from July to December 1878, with their annual per mille ratio, that the system has worked satisfactorily even in the first few months of its commencement.

The system has worked satisfactorily, even in the first six months of its commencement.

Selected area lying on the Western Jumna Canal.	Population according to census of 1877.			Number of Births and Deaths registered during the half year ending in December 1878.						Birth-rate per mille of population per annum.	Death-rate per mille of population per annum.
				Births.			*Deaths.*				
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.		
25 villages in the Delhi district.	14,757	13,226	27,983	411	357	768	852	823	1,675	55	120
23 villages in the Karnál district.	8,254	6,899	15,153	160	114	274	247	189	436	36	57

Cause assigned for the villages in the Delhi district, showing a high birth and death-rate.

19. The villages in the Delhi district show a very high birth and death-rate when compared with those of the Karnal district. The greater proportion in the death-rate of the villages in the Delhi district may be attributed possibly to the heavy mortality caused by epidemic fever and the greater pressure of high prices and distress.

Deaths according to diseases and age in the selected areas.

20. The deaths according to diseases in the selected areas were as follows:—

	Cholera.	*Small-pox.*	*Fever.*	*Bowel complaints.*	*All other causes.*
Villages in the Delhi district ...	...	1	1363	44	267
Villages in the Karnál district ...	...	43	318	7	68

and the mortality at different ages and the ratios per 1000 living as follows:—

	Ages at Death.									Deaths at all ages.
	Under 1 year.	1-6	6-12	12-20	20-30	30-40	40-50	50-60	60 and upwards.	
25 villages in the Delhi district.	447	378	47	56	113	111	155	138	230	1675
Ratio per 1000 of living ...	31·9	27·0	3·0	4·0	8·0	7·9	11·1	9·8	16·5	120
23 villages in the Karnál district.	90	112	16	11	25	29	40	29	84	436
Ratio per 1000 living ...	11·8	14·8	2·11	1·4	3·3	3·8	5·3	3·8	11·1	57

October and November the most sickly weather in the selected areas also.

21. The highest number of deaths in the selected areas also, occurred in the months of October and November, as will be seen on reference to the statement referred to in para. 16 of this report.

Number of persons fined for neglect to register births and deaths.

22. The number of persons fined for neglect to register births and deaths in the municipal towns was 419. In the two previous years the number was 427 and 491, and the amount realized under this head was Rs. 214 in 1878, Rs. 238 in 1877, and Rs. 283 in 1876.

Mortality amongst European and Eurasian population.

23. The number of births and deaths registered in each district of the Province, and the total number from different diseases in the Province amongst the European and Eurasian population under registration will be seen from the two subjoined statements:—

Statement showing the deaths and births registered amongst the European and Eurasian population during the years 1876 *to* 1878.

No.	Name of Districts.	Population under registration.	Deaths registered.			Births registered.		
			1876.	1877.	1878.	1876.	1877.	1878.
1	Delhi	504	23	28	29	29	21	21
2	Gurgaon	6	...	...	2	...	...	...
3	Karnál	8	...	...	...	..	...	...
4	Hissar	63	1	...	...	2	...	...
5	Rohtak	28	1	...	...	...	...	...
6	Sirsa	23	...	...	...	1	...	1
7	Umballa	58	...	...	1	...	...	2
8	Ludhiána	114	...	...	1	...	...	...
9	Simla	2,203	23	33	30	44	52	53
10	Jullundur	55	1	...	...	...	...	...
11	Hoshiárpur	21	...	...	...	...	...	...
12	Kángra	63	2	1	1	...	...	...
13	Amritsar	196	1	1	2	...	...	...
14	Gurdáspur	344	10	7	2	10	10	4
15	Siálkot	2	...	...	...	...	...	...
16	Lahore	1,728	16	26	46	5	3	6
17	Gujránwála	40	1	1	1	1	1	1
18	Ferozepore	unknown.	...	...	...	...	...	...
19	Rawalpindi	1,526	33	9	19	26	12	30
20	Jhelum	58	...	...	...	...	...	...
21	Gujrat	278	...	...	..	...	...	...
22	Shahpur	unknown.	...	...	1	...	...	...
23	Mooltan	132	5	2	2	5	...	...
24	Jhang	42	...	...	...	...	...	...
25	Montgomery	9	...	...	...	...	...	...
26	Muzaffargarh	5	...	...	...	...	...	...
27	Dera Ismail Khan	11	2	...	1	...	...	...
28	Dera Gházi Khan	11	...	1	...	...	...	...
29	Bannu	unknown.	...	...	...	..	...	...
30	Peshawar	Do.	...	...	...	...	...	...
31	Hazára	2	...	1	...	...	...	...
32	Kohát	unknown.	1	...	5	...	...	...
	Total ...	7,530	120	110	143	123	99	118
		Ratio of deaths per 1,000	16	15	19	16	13	16

Deaths from different diseases amongst the European and Eurasian population (under registration) in the Punjab during the years 1876, 1877 and 1878.

Year.	Cholera.	Small-pox.	Fevers.	Bowel complaints.	Injuries.	All other causes.	Total deaths from all causes.
1876	28	1	13	8	4	66	120
1877	...	3	14	12	5	76	110
1878	3	6	31	27	5	71	143

Towns and rural circles which have submitted their returns with great remissness.

24. I regret that I should have occasion to bring to the notice of Government the undermentioned towns for great remissness in the submission of their registration returns to this office.

Towns.	
Muktsar	Ferozepore district
Rám Das	Amritsar district
Bhakkar	D. I. Khan district
All towns in Siálkot district	
Nur Mahal	Jullundur district
Bunga	
Delhi municipality	

Towns.	
Buba	Hazára district.
Mansahra	
Abbott-abad	
Hazro	Rawalpindi district
Attock	
Sukhuchak	Gurdáspur district
Darman	
Una	Hoshiárpur district
Miáni	
All towns of	Ludhiána district

The irregularity on the part of these towns and some of the rural circles also in the districts of Kohát, Ferozepore, Sirsa, Mooltan, Hazára, and Dera Ismail Khan has caused great inconvenience to this office, an unnecessary expenditure of paper, stamps, and trouble in reminders and re-reminders, and has besides caused considerable delay in the preparation of the provincial monthly returns.

SECTION VI.—CHIEF DISEASES OF THE YEAR.

A. CHOLERA.

25, There were 215 deaths registered from cholera in the Province during the year under review. Of these 163 and 44 respectively occurred in Gurgaon and Delhi, the only districts in which it assumed any thing like an epidemic character. Of the remaining eight deaths one each was reported to have occurred in the districts of Umballa, Kángra, Gurdáspur and Lahore, and 2 each in those of Siálkot and Gujránwála. In the district of Gurgaon 10 towns and villages out of a total of 1,239, and in that of Delhi, four out of a total of 743, were reported to have been affected with the disease.

Gurgaon and Delhi the only districts in which Cholera assumed any thing like an epidemic character.

I give below in a tabular form the names of places affected, together with the number of deaths by months, and the date of first death in each of them in the districts of Gurgaon and Delhi :—

GURGAON.

No.	Police station.	Towns or villages.	Population.	Deaths registered in						Total deaths.			Date of 1st death.
				June.	July.	August	September.	October.	November.	Males.	Females.	Total.	
1	Hasanpur ...	Rámgarh ...	608	...	10	...	...	...	...	7	3	10	7th July.
2		Hasanpur ...	3,843	...	3	...	...	...	27	17	13	30	23rd ditto.
3		Tikri ..	125	...	...	...	2	...	...	2	..	2	10th Septr.
4	Palwal ...	Palwal ...	13,553	..	...	6	..	...	...	4	2	6	1st August.
5		Saloni ...	766	...	...	1	...	...	...	1	...	1	7th do.
6	Hodal ...	Hodal ...	7,032	...	3	...	...	...	...	3	..	3	30th July.
7	Rewári ...	Rewári ...	25,190	..	...	40	9	...	...	28	21	49	12th August.
8	Farukhnagar ...	Farukhnagar ...	10,594	...	...	5	25	...	...	14	16	30	25th do.
9		Mubárakpur ...	1,212	...	...	...	30	...	...	18	12	30	7th Septr.
10	Nuh ...	Akbarah ...	2,489	...	...	2	...	...	...	1	1	2	31st August.
		Total ...		...	16	54	66	...	27	95	68	163	

DELHI.

1	Delhi ...	Delhi ...	115,992	2	1	6	3	...	...	8	4	12	10th June.
2		Do. Suburbs ...	44,561	...	...	9	1	7	...	15	2	17	11th August.
3	Ballabgarh ...	Chandaoli ...	1,552	...	8	..	..	...	...	6	2	8	9th July.
4	Chansah ...	Sahupura ...	1,291	...	7	...	..	...	...	3	4	7	10th July.
		Total ...	...	2	16	15	4	7	...	32	12	44	

GURGAON DISTRICT.—

26. As will be observed from the above statement, the first cholera death took place in this district in the village of Rámgarh. A Hindu Brahman resident of the village died on the 7th July after 5 hours illness. The disease prevailed here for a week, and caused altogether 10 deaths, the last death occurred on the 13th July.

Detail of outbreak in Gurgaon District.

The following particulars regarding the outbreaks in the towns of Palwal, Hodal, Rewári and Farukhnagar are extracted from the report of Assistant Surgeon Chetan Shah, Rai Bahadur.

"At Palwal the 1st case occurred on the 25th July, one on the 31st, one on the 3rd August, one on the 4th, one on 6th and so on. Altogether 12 cases with 6 deaths.

"At Hodal 4 persons (2 men and 2 children) were attacked with choleraic symptoms on the 29th of July. Of these, two children died, and the men recovered. On the 30th, 2 fresh cases occurred, of which one proved fatal. Some 9 more cases appear to have been reported and recovered. All these cases were traced by Mr. Crow, the late Civil Surgeon, to error of diet in weak subjects.

"At Rewári cholera is said to have commenced on the 13th of August when there were 6 seizures, all amongst the Chamárs; but Mr. Crow writes that the Assistant Surgeon informed him "that he had observed sometime previous to the outbreak of the epidemic that several amongst the distressed people were suffering from a most severe and obstinate type of diarrhœa invariably terminating in collapse and death," in spite of medical treatment. These cases, I think, must have been cases of cholera. On the 14th another case occurred, and this also amongst the Chamárs. On the 15th it appeared simultaneously in the different parts of the town. There were 25 fresh attacks and 4 deaths, from which date, the daily seizures steadily numbered from 20 to 25. On the 20th there were 15 cases, on the 21st 28, on the 22nd 12, on 23rd 5. On the whole, the epidemic was slight, and of a mild type. There were altogether 239 cases with 49 deaths up to date of Dr. Crow's report.

"At Farukhnagar cholera was reported to have occurred in the last week of August and in September. Altogether 87 cases had been reported with 32 deaths, but Dr. Crow's personal enquiries proved to him that "they were cases of simple dyspepsia due to error in diet," yet of these cases of dyspepsia 12 occurred on one day and on another 5 died.

The disease, which had disappeared in Hasanpur after causing 3 deaths in July, again made its appearance there in the month of November after an interval of 3 months, and proved fatal in 30 cases; the last case occurring on the 16th November. As to the cause of the outbreak of the disease in Rewári, the late Dr. Crow stated thus in his report of 2nd September 1878 submitted to the Deputy Commissioner Gurgaon. "It is at all times a very difficult matter to trace the origin of this disease in a native town, but in this instance it appears to me clear and easy of solution. The town of Rewári has been infested with the poor and distressed from the Ulwar and Jeypur territories where cholera has prevailed, and human intercourse has no doubt been the channel of contagion." But a detailed account of the first case with reasons for the opinion that the disease was imported into Rewári by "human intercourse" has not been recorded.

There is no record of meteorological observations kept in the district.

Delhi.

Detail of outbreak in the Delhi district.

27. In the Delhi district altogether 44 deaths were registered. Of these 12 occurred in the city of Delhi, and 17 in its suburbs; 8 in Chandauli and 7 in Sahupura, villages in the Ballabgarh tahsíl.

"In the city of Delhi," says Dr. Fairweather in his Sanitary Report, "the first case occurred on 6th April, and there was no history of any communication between it and a previously affected place or person." This case has not been shown in the municipal returns received in this office. In the 2nd and 3rd cases which occurred in June, Dr. Fairweather states that "there *had* been communication with previously affected places, and in both instances seizure occurred soon after arrival. The disease showed itself in the city in a most erratic way; solitary cases, apparently quite unconnected with each other, cropping up in different and often widely separated parts of the town. But up to beginning of August only 8 cases had occurred altogether. After that the disease gained impetus. It then gained access to the Poor-house, where several hundred famine-stricken wretches were crowded together, and where it for the first time appeared to localize itself. Here 12 cases occurred up to 3rd September, when it ceased there."

In the Jail, cholera broke out on 20th September. There were 9 cases in it, of which 7 proved fatal. In the Lunatic Asylum 2 cases occurred, the first on the 21st August, and the second on 26th September. According to Dr. Fairweather's report there were altogether 59 cases and 34 deaths in the city and suburbs of Delhi; and "except in the Poor-house and Jail the disease could hardly be said to have assumed an epidemic character."

The disease made its appearance in the Ballabgarh tahsíl in the beginning of July, having, in the opinion of Dr. Fairweather, "apparently spread to it from the Gurgaon district. It affected only two villages Chandauli and Sahupura; in the former of which there were 19 cases and 8 deaths, and in the latter 14 cases and 7 deaths."

"Little can be said," says the Civil Surgeon, Dr. Fairweather, "about the connection, if any, between the progress of the disease and the meteorology of the season. There was great prevalence of easterly winds during the hot weather, and certainly if cholera can be carried by these from eastern Bengal, we ought to have had a severe outbreak. There was almost total absence of rain till August, and the increase of the disease in that month may be attributed to the greater moisture in the atmosphere, but the disease as a rule shows a tendency to increase in August if it is in the Punjab at all, and the increase on this occasion preceded by some time the fall of rain."

B.—SMALL-POX

Small-pox deaths in 1878 higher than in previous years since introduction of registration system, with the exception of 1869.

28. During the year under review, 40,271 deaths were registered under the head of small-pox, giving a ratio of 2·30 per 1,000 of population in the Province. The mortality from this disease in the previous years since 1868 is given below:—

Year.	No. of deaths.
1868	24,222
1869	53,169
1870	27,163
1871	25,534
1872	23,728
1873	25,699
1874	12,026
1875	13,594
1876	10,254
1877	12,296

It will thus be seen that with the exception of 1869, in none of the previous years did the mortality from small-pox rise so high as in the year under report.

Chart showing the rise and fall in prevalence of small-pox during the years 1876, 1877, 1878, and 1869.

29. The regular rise and fall in the prevalence of this disease is well illustrated in the annexed chart showing the monthly distribution of small-pox deaths in the Punjab during the years 1876, 1877, 1878, and 1869. I have introduced the course of the disease in 1869 in order to compare it with that of the year under review, because in both years the conditions favouring its excessive prevalence were

Statement showing prices of principal food-grains during the same four years.

the same, as will be seen by an examination of the accompanying tabular statement showing the prices of the principal food-grains during the same four years.

No.	Names of Stations.	Wheat				Rice				Pulses			
		1869	1876	1877	1878	1869	1876	1877	1878	1869	1876	1877	1878
1	Delhi	12	25	20	14	8	11	9	7	10	27	21	10
2	Gurgaon	11	25	20	14	8	11	9	6	9	27	20	10
3	Karnál	12	25	20	16	8	13	10	7	9	24	18	10
4	Hissar	9	23	20	13	6	11	11	7	9	35	24	14
5	Rohtak	11	25	20	14	7	14	10	6	9	30	22	12
6	Sirsa	9	23	22	13	6	11	11	7	8	30	23	13
7	Umbalia	11	22	22	17	7	14	13	8	9	27	21	10
8	Ludhiana	11	25	24	17	6	12	11	7	8	24	19	9
9	Simla	9	16	15	11	5	10	8	5	7	14	12	7
10	Jullundur	11	25	24	17	8	11	10	7	8	22	18	9
11	Hoshiárpur	11	26	24	18	7	10	10	9	8	21	17	9
12	Dharmsála	9	17	15	13	8	15	13	11	7	14	12	7
13	Amritsar	11	26	24	17	7	14	12	9	9	24	19	9
14	Gurdáspur	11	24	23	17	7	9	9	7	8	17	16	7
15	Sialkot	12	25	22	16	8	7	7	6	9	21	17	9
16	Lahore	11	25	24	16	8	14	14	8	8	21	17	8
17	Gujranwála	12	24	23	16	7	11	14	8	9	20	17	10
18	Firozpur	10	27	28	18	7	10	11	6	10	28	22	9
19	Rawalpindi	14	32	30	18	6	8	6	6	8	19	13	8
20	Jhelum	12	30	27	18	5	9	9	7	8	22	17	10
21	Gujrat	13	27	25	16	7	12	11	8	8	17	15	9
22	Shahpur	12	29	28	17	7	9	5	6	9	18	18	10
23	Mooltan	12	22	21	13	8	10	8	7	8	18	16	8
24	Jhang	12	25	24	14	6	10	11	7	9	18	19	9
25	Montgomery	11	27	28	16	7	10	10	7	7	17	15	8
26	Muzaffargarh	14	22	21	13	6	10	9	7	7	13	13	6
27	Dera Ismail Khan	15	33	28	16	7	9	10	6	9	17	14	9
28	Dera Ghazi Khan	14	22	21	13	8	10	10	8	7	14	13	8
29	Bannu	18	46	40	20	6	8	8	7	9	20	14	9
30	Peshawar	17	26	26	17	8	10	10	7	8	18	12	7
31	Abbottabad	11	27	25	14	4	12	14	6	7	18	12	7
32	Kohat	15	35	32	19	6	12	12	10	11	22	12	8

The chart shews that this disease has its special seasons of activity.

The food statement shows the extent to which the activity of the disease is influenced by circumstances of plenty and scarcity.

30. The chart shows very clearly that small-pox has its special seasons of activity, in May, June. and December, January, under all circumstances, whilst the table of food prices shows the extent to which the activity of the disease is influenced by circumstances of plenty and scarcity. The lesser mortality in 1878 may be fairly attributed to the partial protection afforded by a more extended vaccination than existed in 1869.

Deaths according to age from small-pox.

31. Of the 40,271 deaths from the disease registered during the year 1878, 8,598 occurred amongst children under 1 year, 30,018 amongst those between one and under 12, and 1,655 in persons above 12 years of age.

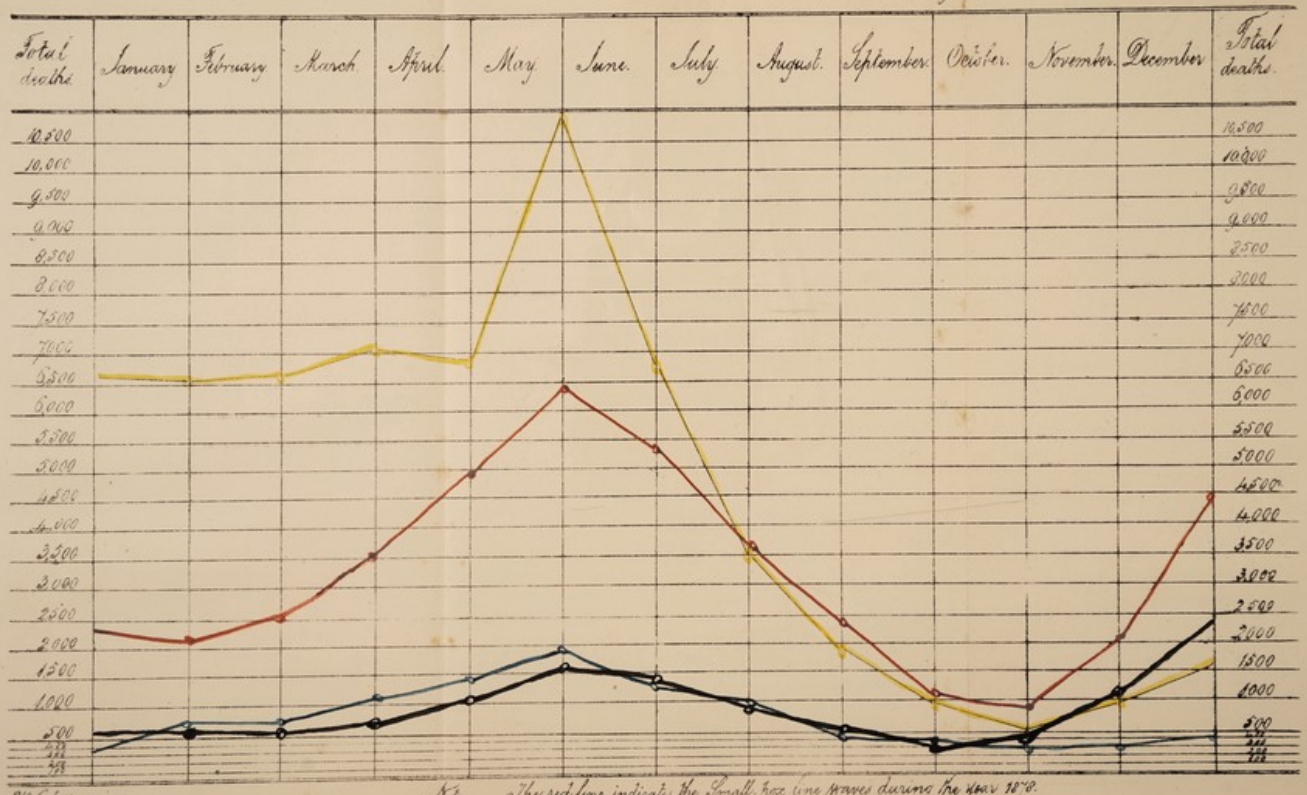
The Districts of Gurgaon and Montgomery most affected by the disease.

32. It would appear from annual form No. VIII appended to this report that the districts of Gurgaon, and Montgomery suffered terribly from the disease. The number of deaths registered in them during the year was 6,919 and 3,086 respectively, giving a death-rate of 9·93 and 8·58 per mille of population. The epidemic in the Gurgaon district would seem to have appeared in October 1877, in which month the number of deaths registered from it was 19. From this month it went on growing worse and worse till it reached its climax in April 1878, when the mortality rose as high as 1,920. In the following month of May the mortality fell to 1,475 and went on rapidly declining till October, when the number of deaths registered was only 4.

Opposition to vaccination in the Gurgaon district.

33. "Vaccination" says Rai Bahadur Chetan Shah, Civil Surgeon of the Gurgaon district "does not appear to have made any real progress till this year, when it was undertaken by the Punjab Vaccine Establishment. Though great numbers appear to have been shown in the vaccination returns of former years, really none, or very few, were successfully vaccinated, at least as far as I have been able to examine. I have not come across 5 children who have marks of successful previous vaccination. The work done by the Punjab Vaccine Establishment this season seems to have been excellent. I carefully examined several children at Farukhnagar and Rewari and found the marks as good as possible. The two permanent vaccinators attached to the Sadr Dispensary were sent this time to learn the work along with the vaccinators of Dr. Bennet's establishment, and they have returned apparently skilful operators; I have sent them to the Palwal tahsíl, which remains to be vaccinated, and where I myself intend to go to supervise their work." This is a step in the right direction, and should, as recommended in my Sanitary Report for last year, be carried out in all the districts of the Province. As pointed out in the report referred to, the injury done to the cause of vaccination in this Province by the employment in connection with

Chart showing the monthly distribution of Small-pox deaths in the Panjab during the years 1876, 1877, 1878 and 1869.



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Note — The red line indicates the Small pox line waves during the year 1878.
The black line ____ Do. ____ Do. ____ of ____ 1877.
The green line ____ Do. ____ Do. ____ 1876
The yellow line ____ Do. ____ Do. ____ 1869.

Chart showing the monthly distribution of Fever deaths in the Punjab during the years 1876, 1877 and 1878.

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Note. The red line indicates the fever line were during the year 1878.
The black line ___ Do. ___ Do. ___ 1877
The green line ___ Do. ___ Do. ___ 1875.

dispensaries and municipalities of uneducated and unskilful men as vaccinators is incalculable. The employment of these men as vaccinators should be authoritatively prohibited until they produce a certificate of qualification from the head of the Vaccination Department of the Province.

The cause of the Gurgaon district being the greatest sufferer from small-pox in the Province in this as in past years is attributed to the great opposition which the people have offered to vaccination, owing, it is believed, to the existence in that district of a well-known temple of Sitla, the goddess of small-pox. However great may be the influence of the goddess with the people of this district, and this influence it may be stated is exercised by her in every part of the Province, it is nevertheless confidently hoped that vaccination vigorously carried on in the district and by competent agency will in a short time, by the force of its own merits, and as it has already done in many parts of the Province, remove the prejudices they have hitherto had against the prophylactic. I visited the temple in the course of my inspection tour during the past cold season, and a detailed account of my inspection will be found in section X, "General Remarks."

Rise and fall of the disease, and state of vaccination in the Montgomery district.

34. In the Montgomery district the disease appeared in October 1877, attained its maximum fatality in May 1878 (when no less than 549 deaths from it were registered) and steadily declined to 97 in November. In December, however, the mortality again rose to 178. With regard to the state of vaccination in this district, the Civil Surgeon, Mr. Crossley, states—"I have never had so much trouble anywhere as in this district. The utter indifference of almost every native official and the community at large is wonderful, especially when it is considered that inoculation by their own class is freely resorted to. However, now that the Provincial Establishment will soon pass through for the first time since the annexation, I believe much of the ignorance and fixed prejudices will no doubt be overcome."

Districts most affected next to Gurgaon and Montgomery.

35. Next to Gurgaon and Montgomery in order of severity of the epidemic were the districts of Karnál, Lahore, Mooltan, Amritsar, Gujrát and Muzaffargarh. In these 8 districts alone (including Gurgaon and Montgomery) the number of small-pox deaths amounted to no less than 25,167, or a little less than $\frac{2}{3}$ of the total mortality registered from it in the whole Province. In the districts of Jullundur, Hoshiárpur, Kangra, where, in comparison with other districts, vaccination is readily accepted by the people, the mortality was very low.

Towns most affected.

36. Of the principal towns (*vide* statement No. VI appended to this report) the following suffered most severely.

District.	Town.	Small-pox death-rate per mille of population.
Gurgaon	Farukhnagar	10·85
	Rewári	16·59
	Firozpur	6·74
	Palwal	7·60
Ambalia	Shahabad	9·95
	Sádhaura	6·63
Gujránwála	Gujránwála	7·17
Gujrat	Gujrat	7·47
	Jalalpur	10·42
Jhang	Maghiana	12·19

C.—FEVERS.

Mortality from fevers higher in 1878 than in any previous year since commencement of registration.

37. The total deaths registered in the Punjab from diseases classed under this head during the year 1878 are 440,492. In 1876 the total was 351,286, which is the highest figure previously recorded for any year since registration was commenced in 1868. The excess of mortality under this head during 1878 is 89,206. The ratio per mille for this year is 25·19 against 20·09 in 1876 and 12·54 in 1877, which was the healthiest year on record since the introduction of registration.

Chart showing fever line wave during 1876, 1877 and 1878.

The year 1878 corresponds very closely to that of 1876.

38. As in the year 1876 so in that under review the greatest mortality occurred in the autumn months and fell again as usual in December. The highest number registered in any one month was in November, *viz.*, 90,669, and the lowest in February, *viz.*, 16,518. In this rise and fall the year 1878 differs very remarkably from the preceding year, and very closely resembles the course recorded in the year 1876. This is very clearly seen in the annexed chart showing the monthly distribution of fever deaths in the Punjab during the years 1876, 1877, 1878.

Climatic and meteorological conditions of the three past years considered in regard to the rise and fall in the fever mortality.

39. In paragraph 53 of my Sanitary Report for 1877, the decline in the fever mortality of that year was attributed to the diminished rain-fall of the monsoon, and the atmospheric and telluric conditions consequent thereto: circumstances which were out of the ordinary course of the climate and meteorological phenomena as observed to prevail in this Province. And in para. 70 of the same report it was shown that the sudden rise in the fever mortality of the Province during the autumn months for the preceding eight years was the invariable rule of the regular monsoon. The year 1877, in fact, was an exceptional year in respect to its monsoon season, whilst the year under review (1878) though it had a much heavier spring rain-fall than usual, was an ordinary one in the like respect. And this fact of itself will account for some part of the rise

in the fever mortality of this year over that of the preceding. But not for all, nor for the enormous increase in mortality from other causes. The increased mortality in 1878 under all heads except that of cholera is due to the operation of other causes of an exceptional character (as will be noticed hereafter) in combination with those attributable to the influences of climate and the conditions of locality.

Statement showing mortality by months from principal death causes and the chief meteorological conditions of the years 1876, 1877 and 1878.

40. An examination of the subjoined tabular statement showing the mortality by months from the principal death causes and the chief meteorological conditions of the years 1876, 1877 and 1878, will show the points in which the first and last of these years resemble each other and differ from the intermediate one

Table showing the Mortality by months from the principal death causes, and the chief Meteorological conditions of the years 1876, 1877, 1878.

Years.	Month.	Meteorological conditions of the year.								Mortality from principal death causes.					
		Mean atmospheric pressure.	Temperature of air. Maximum.	Minimum.	Mean daily range.	Mean relative humidity.	Rain-fall. Maximum.	Mean.	Quarterly Total.	Cholera.	Small-pox.	Fevers.	Bowel complaints.	Other causes.	All causes.
1876	January	27·960	75·6	30·2	24·9	52·2	7·10	0·79		4	722	19,815	1,477	8,309	30,327
	February	28·013	77·9	29·3	25·8	45·8	8·07	0·81		7	770	13,570	984	6,819	22,150
	March	27·950	87·4	39·7	24·4	44·7	18·19	1·82	33·36	2	1,127	12,771	906	7,089	21,895
	April	27·905	103·2	46·1	30·9	27·5	14·38	1·31		6	1,432	11,973	1,033	6,286	20,730
	May	27·809	109·3	57·2	30·1	29·5	15·06	1·37		8	1,824	13,588	1,251	6,970	23,871
	June	27·718	112·3	62·9	28·6	33·3	16·87	1·53	46·31	216	1,374	14,182	1,562	7,207	24,561
	July	27·650	110·7	68·8	17·9	63·8	125·96	11·45		1,196	1,090	12,712	1,440	7,392	23,730
	August	27·772	98·1	68·2	16·2	66·89	79·38	6·42		1,396	502	12,475	2,217	9,470	31,060
	September	27·959	97·1	61·7	21·1	57·0	28·66	2·61	225·20	1,427	340	53,465	4,539	12,207	71,972
	October	28·077	90·7	50·3	23·8	50·7	19·42	1·77		1,277	315	87,951	5,045	11,711	105,400
	November	28·138	82·7	36·9	26·5	44·9	43·33	3·94		280	307	57,186	2,808	9,592	71,083
	December	28·168	74·1	34·0	28·6	45·5	0·65	0·06	63·40	3	451	37,497	2,709	9,405	50,065
	Mean Total	28·001	93·2	48·9	24·9	46·10	27·35	2·82	92·06	5,736	10,254	351,286	27,271	102,297	496,844
1877	January	28·256	70·9	32·9	20·5	63·3	29·31	2·66		2	705	22,411	1,442	7,887	32,447
	February	28·158	75·5	32·9	22·0	55·8	26·83	2·62		2	620	16,985	871	7,321	25,899
	March	28·070	83·3	44·7	23·0	48·4	14·62	1·33	72·76	2	778	16,569	899	8,253	26,492
	April	28·024	91·6	49·6	22·3	56·2	37·92	3·45		3	1,074	14,911	1,097	7,432	24,527
	May	27·887	104·3	61·4	23·6	43·6	16·51	1·50		7	1,542	18,012	1,851	8,825	30,237
	June	27·782	109·9	66·7	24·4	56·6	20·08	1·82	74·51	3	1,470	21,329	2,075	9,114	33,991
	July	27·798	106·2	67·8	21·6	45·2	27·65	2·51		2	975	17,770	1,628	7,778	28,153
	August	27·754	107·6	67·6	24·4	42·9	13·26	1·21		1	518	15,769	1,412	7,682	25,382
	September	27·905	100·9	61·3	24·2	44·9	35·46	3·22	76·37	4	307	14,938	1,391	8,112	24,752
	October	28·094	98·3	49·5	24·6	48·5	24·18	2·20		1	394	18,623	1,576	8,915	29,509
	November	28·165	84·7	42·2	21·7	55·10	34·06	3·10		2	1,283	21,214	1,759	9,651	33,909
	December	28·178	71·3	34·1	17·4	68·4	45·31	4·12	149·55	...	2,630	21,650	1,762	10,682	36,724
	Mean Total	28·006	92·0	51·1	22·5	50·2	27·24	2·48	81·79	29	12,286	2,19,281	17,664	101,662	350,902
1878	January	28·212	69·1	29·2	22·0	57·5	9·79	0·89		1	2,231	19,507	1,383	11,605	34,107
	February	28·113	71·8	36·7	18·8	63·3	32·66	2·97		4	2,626	16,518	1,013	9,549	29,710
	March	28·028	91·2	39·6	26·2	41·6	2·97	0·27	45·42	...	3,565	17,739	1,174	9,734	32,212
	April	27·958	100·1	50·8	23·7	47·0	42·94	3·90		...	4,927	17,939	2,311	9,064	31,292
	May	27·875	98·6	60·4	22·7	46·4	37·41	3·40		...	6,483	25,722	4,160	11,231	47,596
	June	27·738	110·3	68·8	23·1	56·0	11·60	1·05	91·95	2	5,243	26,367	2,958	9,444	44,014
	July	27·451	108·9	68·7	18·3	59·0	74·43	6·76		32	3,877	19,576	1,774	8,077	33,336
	August	27·791	97·0	70·9	13·7	74·9	116·70	10·61		70	2,444	20,599	2,282	9,081	34,476
	September	27·847	97·3	65·1	20·2	58·9	10·91	0·99	202·04	70	1,225	42,943	3,256	9,772	57,266
	October	27·995	97·0	69·4	26·6	41·0	2·88	0·26		8	984	89,687	4,394	10,729	105,802
	November	28·114	86·9	39·8	21·6	38·0	...	...		27	2,258	90,689	4,236	10,982	107,272
	December	28·155	78·4	36·5	29·9	43·0	2·44	0·22	5·32	1	4,408	53,175	3,159	7,954	68,688
	Mean Total	27·917	92·2	51·7	23·2	50·4	28·72	2·61	86·18	215	40,271	440,492	32,071	115,722	628,771

* The Meteorological observations were taken in 11 Districts which from their Geographical position have been so selected as to give an approxmately accurate record of the meteorology of the Province.

The rain-fall and rise and fall of the fever mortality of 1878 compared with that of 1876.

41. So far as concerns the fever mortality it will be seen that the monthly figures in 1878 are higher throughout, than those of the corresponding months of 1876, excepting only January, in which they are nearly equal. And it will be noted that this increased fever mortality during the first three months of 1878 followed an excessive winter rain-fall of the preceding year with a concurrent excessive rain-fall in the aggregate proportion (for 11 districts) of 45·42 inches in 1878, against 33·36 inches in 1876, whilst in the succeeding three months the figures ranged at abnormally higher rates than in 1876 in concurrence with a rain-fall of nearly double the aggregate quantity measured in the corresponding period of that year, that is 91·95 inches against 46·31 inches. Further, it will be observed that after the alternate rise and fall referred to in para. 70 of my report for last year, the usual sudden bound upwards occurred in September, and continued till the usual decline in December took place as the ordinary consequent of a regular monsoon. The aggregate rain-fall of the 1876 monsoon (11 districts) was 225·20 inches against 202·4 inches in 1878. The difference is not great, but the mortality from fevers during the corresponding periods of the two years is out of all proportion. For the fever months, (September, October, and November) of 1876 the aggregate is 197,703, and of 1878 it is 223,299, or an excess of 25,596. This excess is attributable to exceptional causes of widespread operation, which I shall presently mention.

42. In 1877, it will be noted that the distribution of the rain-fall according to seasons was altogether abnormal, and with the results described in the section corresponding to this one of my report for that year. The same class of climatic and atmospheric influences which have operated to produce a regular and periodical rise and fall in fever mortality during previous years of ordinary succession of the seasons, or at all events, which have been accompanied and followed by such rise and fall, with singular regularity, have prevailed during the year under review, and with corresponding behaviour on the part of the fever mortality, although to an increased extent (in common with almost every other disease cause) as the result of an extraneous and exceptional agency. Nothing of this kind is observable in the year 1877 with its dislocated rain-fall and seasons of drought, notwithstanding that the extraneous and exceptional agency above referred to, *viz.*, high prices, scarcity of food, and widespread poverty,—in short, general distress, were during the whole of that year pressing upon the millions from whose ranks these death figures are swelled. In fact there is reason to believe that, but for the action of the high prices of food during 1877, the mortality of that year would have been considerably less than the returns make it out to have been, and on a par with 1874, which it much resembled in its general characters.

The rain-fall of 1877 according to seasons altogether abnormal, and were it not for high prices and widespread distress, the mortality during that year would no doubt have been still lower than what was registered.

43. The annexed tabular statement showing the aggregate rain-fall in inches, prices current of the chief articles of food, and the fever mortality for each of the 32 districts of this Province by quarters, during the past four years from 1875 to 1878, inclusive, will show how climatic influences and high prices have in combination operated to raise the death-rate in this class of diseases. The rise in the prices of the several food grains during the past two years as compared with the two preceding them is very striking, as also is the relation of fever mortality to rain-fall, though this is somewhat interfered with generally by the effects of the ruling high prices of 1877 and 1878, and more especially so by the local conditions, in a sanitary sense, of particular towns, such as Karnál, Jullundur, Hoshiarpur, Ludhiána, Wazirabad, &c. the main defects of which have been mentioned in my inspection reports submitted to Government.

The statement of rain-fall and prices current of the chief articles of food shows how climatic influences and high prices have in combination operated to raise the death-rate from "fevers."

Aggregate rain-fall

	NAME OF DISTRICT.	1st Quarter.				2nd Quarter.				3rd Quarter.			
		1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.
1	Delhi	1·4	1·7	3·7	2·1	0·8	5·7	5·2	2·0	39·8	11·9	1·2	33·0
2	Gurgaon	1·1	2·6	4·0	2·4	1·9	2·5	6·6	1·3	42·1	22·3	3·3	24·4
3	Karnál	5·0	2·0	6·8	3·8	2·8	2·5	10·3	7·0	30·6	14·2	4·3	14·9
4	Hissar	2·2	0·3	3·9	1·2	0·7	2·3	7·5	4·3	22·2	16·3	2·9	14·9
5	Rohtak	1·5	0·4	2·3	1·4	0·4	4·2	5·6	3·9	28·2	11·7	3·0	15·2
6	Sirsa	0·5	0·6	2·1	0·6	0·7	2·5	3·6	8·5	17·4	10·6	4·3	13·5
7	Umballa	3·0	0·7	7·5	6·8	1·0	3·1	3·9	5·4	29·5	21·1	5·9	25·5
8	Ludhiána	1·6	3·1	6·8	2·5	2·0	2·9	2·9	6·0	31·0	7·9	19·3	23·1
9	Simla	5·4	4·0	13·1	6·5	13·2	14·8	25·1	16·3	58·6	54·4	21·6	37·7
10	Jullundur	2·4	3·9	10·6	3·2	3·2	4·3	3·6	6·1	49·0	18·4	16·3	35·0
11	Hoshiárpur	2·8	4·2	9·4	5·4	3·5	5·6	7·3	6·3	36·7	24·5	22·5	36·3
12	Kangra	10·2	10·1	19·5	12·2	14·2	7·7	19·7	16·0	128·2	120·4	35·7	111·6
13	Amritsar	1·9	1·0	10·4	4·1	2·2	1·9	6·7	5·3	37·1	25·9	6·8	23·2
14	Gurdáspur	1·5	4·3	12·0	5·0	2·2	0·8	4·0	6·3	49·4	28·8	10·2	10·3
15	Siálkot	2·2	2·3	9·6	4·1	1·0	4·3	9·2	5·4	44·2	42·9	4·5	20·4
16	Lahore	2·1	0·9	6·0	2·2	1·9	1·6	2·9	2·2	27·4	17·9	3·5	12·4
17	Gujránwála	1·7	2·9	8·8	5·0	2·5	4·8	2·3	4·8	39·5	23·5	3·3	17·3
18	Ferozepore	0·6	1·8	2·2	0·8	1·0	1·3	4·0	5·2	27·4	9·8	4·6	11·6
19	Rawalpindi	4·0	8·8	12·1	5·8	2·5	5·5	7·8	12·5	35·7	17·3	6·9	14·1
20	Jhelum	1·9	3·6	15·1	2·5	0·9	5·1	3·8	4·7	24·2	11·4	4·5	18·6
21	Gujrat	1·8	5·3	10·6	4·5	1·8	5·5	4·9	3·8	26·4	28·3	4·3	20·6
22	Shahpur	1·8	2·7	5·2	10·0	1·2	3·9	4·2	4·4	6·5	7·2	0·6	14·9
23	Mooltan	...	...	1·4	0·7	0·6	1·3	1·4	1·1	2·7	4·4	9·7	8·1
24	Jhang	0·2	1·3	2·8	1·9	...	0·4	6·7	2·3	8·0	4·0	4·9	9·2
25	Montgomery	0·8	0·3	12·6	0·4	...	0·7	2·3	3·4	0·9	7·3	3·8	13·9
26	Muzaffargarh	...	...	2·0	0·2	...	0·6	1·9	1·7	4·9	7·1	6·5	8·2
27	D. I. Khan	3·8	1·5	4·1	2·0	...	2·8	3·3	5·4	6·9	3·8	0·4	8·9
28	D. G. Khan	0·5	0·5	1·9	0·5	1·4	1·4	0·9	2·2	5·4	7·2	1·4	5·6
29	Bannu	4·2	4·2	4·0	3·3	0·6	1·7	7·8	7·6	9·6	5·6	1·8	4·7
30	Peshawar	4·7	6·2	6·8	3·8	0·8	1·7	6·2	7·2	9·9	5·2	...	10·8
31	Hazára	10·2	8·9	14·3	14·0	6·9	5·9	19·7	13·6	27·2	30·6	9·1	19·4
32	Kohát	4·4	6·5	7·1	3·6	3·6	2·9	6·5	4·3	17·7	8·1	2·5	15·9
	Total ...	85·4	96·6	238·7	122·5	75·5	112·2	207·8	186·5	924·3	630·0	229·6	653·2

in inches.								*Price current of chief articles of diet.*											
4th Quarter.				Total.				Wheat.				Rice.				Pulses.			
1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.
0·2	2·0	8·1	...	42·2	21·3	18·2	37·1	22	25	20	14	10	11	9	7	21	27	21	10
0·4	3·4	5·9	...	45·5	30·8	19·8	28·1	21	25	20	14	9	11	9	6	22	27	20	10
...	1·4	5·6	0·9	38·4	20·1	27·0	26·6	24	25	20	16	11	13	10	7	19	24	18	10
0·1	1·9	2·1	0·4	25·2	20·8	16·4	20·8	21	23	20	13	12	11	11	7	24	35	24	14
...	1·3	4·4	...	30·1	17·6	15·3	20·5	22	25	20	14	12	14	10	6	23	30	22	12
0·7	3·8	3·9	0·9	19·3	17·5	13·9	23·5	21	23	22	13	10	11	11	7	17	30	23	13
0·3	1·6	6·4	1·6	33·8	26·5	23·7	39·3	24	22	22	17	13	14	13	8	23	27	21	10
1·5	0·7	8·5	0·1	36·1	14·6	37·5	31·7	25	25	24	17	12	12	11	7	20	24	19	9
1·9	2·5	5·4	0·1	79·1	75·7	65·2	60·6	17	16	15	11	10	10	8	5	14	14	12	7
1·1	0·5	9·1	...	55·7	27·1	39·6	44·3	25	25	24	17	11	11	10	7	19	22	18	9
1·6	1·2	8·6	0·1	44·6	35·5	47·8	48·1	26	26	24	18	10	10	10	9	18	21	17	9
4·0	2·6	21·4	1·6	156·6	140·8	96·3	141·4	19	17	15	13	15	15	13	11	16	14	12	7
1·8	1·9	8·6	...	43·0	30·7	32·5	32·6	25	26	24	17	14	14	12	9	22	24	19	9
2·0	1·4	11·7	...	55·1	35·3	37·9	21·6	25	24	23	17	8	9	9	7	17	17	16	7
1·5	0·6	9·1	0·3	48·9	50·1	32·4	30·2	24	25	22	16	7	7	7	6	20	21	17	9
1·8	1·1	4·2	0·2	33·2	21·5	16·6	17·0	23	25	24	16	13	14	14	8	19	21	17	8
2·5	1·9	9·5	0·8	46·2	33·1	23·9	27·9	23	24	23	16	12	11	14	8	18	20	17	10
...	0·6	4·4	0·2	29·0	13·5	15·2	17·8	25	27	28	18	10	10	11	6	24	28	22	9
6·6	3·2	13·8	0·8	48·8	34·8	40·6	33·2	29	32	30	18	7	8	6	6	19	19	13	9
1·9	2·2	12·8	0·7	28·9	22·3	36·2	26·5	29	30	27	18	10	9	9	7	22	22	17	10
2·3	3·3	11·0	1·2	32·3	42·4	30·8	30·1	25	27	25	16	11	12	11	8	17	17	15	9
1·5	2·2	5·4	...	11·0	16·0	15·4	29·3	27	29	28	17	7	9	5	6	18	18	18	10
0·4	0·5	1·1	0·4	3·7	6·2	13·6	10·3	22	22	21	13	10	10	8	7	18	18	16	8
0·1	0·4	2·5	...	8·3	6·1	16·9	13·4	22	25	24	14	10	10	11	7	17	18	19	9
0·2	0·2	2·3	...	1·9	8·5	21·0	17·7	21	27	28	16	9	10	10	7	16	17	15	8
0·4	1·0	1·2	...	5·3	8·7	11·6	10·1	23	22	21	13	13	10	9	7	14	13	13	6
0·6	1·6	3·9	...	11·3	9·7	11·7	16·3	33	33	28	16	9	9	10	6	16	17	14	9
0·6	1·5	1·5	...	7·9	10·6	5·7	8·3	23	22	21	13	10	10	10	8	14	14	13	8
1·8	0·7	5·1	...	16·2	12·2	18·7	15·6	46	46	40	20	8	8	8	7	18	20	14	9
3·2	2·8	12·5	...	18·6	15·9	25·5	21·8	24	26	26	17	12	10	10	7	17	18	12	7
11·8	6·9	26·2	1·3	56·1	52·3	69·3	48·3	20	27	25	14	9	12	14	6	15	18	12	7
2·8	5·5	19·0	2·4	28·5	23·0	35·1	26·2	30	35	32	19	13	12	12	10	23	22	12	8
55·6	62·4	255·2	14·0	1140·8	901·2	931·3	976·2	25	26	24	16	11	11	10	7	19	21	17	9

Fever

	NAME OF DISTRICT.	1st Quarter.				2nd Quarter.			
		1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.
1	Delhi	2,442	1,857	1,717	2,169	2,870	1,667	2,130	3,481
2	Gurgaon	1,822	1,654	1,355	2,658	2,125	1,403	1,621	4,297
3	Karnál	1,654	1,532	1,632	1,555	2,014	1,603	1,764	2,515
4	Hissar	1,260	826	751	1,352	1,452	794	835	1,689
5	Rohtak	2,213	1,364	1,453	1,860	2,631	1,437	1,823	2,239
6	Sirsa	616	524	463	642	571	427	471	797
7	Umballa	3,374	1,723	2,680	1,973	3,143	2,256	2,735	2,999
8	Ludhiána	1,482	896	1,268	1,340	1,563	1,125	1,662	2,168
9	Simla	31	24	31	46	58	43	49	66
10	Jullundur	2,138	2,376	3,792	2,263	2,987	2,373	3,196	3,642
11	Hoshiárpur	2,173	2,439	3,286	2,688	2,882	2,312	3,228	3,436
12	Kangra	1,654	1,714	2,059	2,788	2,059	1,956	1,942	2,297
13	Amritsar	2,606	2,178	3,196	2,584	2,783	1,866	2,868	3,396
14	Gurdáspur	2,987	3,028	4,113	3,929	2,713	1,879	3,583	4,048
15	Siálkot	2,659	1,819	3,192	3,386	2,325	1,545	3,121	4,007
16	Lahore	3,200	3,223	3,541	3,280	2,233	2,153	2,739	3,654
17	Gujránwála	1,541	1,577	2,890	2,057	1,160	1,563	2,373	2,837
18	Ferozepore	966	672	952	1,259	900	679	925	1,770
19	Rawalpindi	3,217	1,560	1,692	2,445	1,925	1,714	2,236	3,824
20	Jhelum	1,949	960	1,041	1,346	1,099	963	1,257	1,876
21	Gujrat	1,697	1,263	1,602	1,782	1,189	1,192	1,796	2,811
22	Shahpur	1,437	797	973	1,106	855	658	1,068	1,247
23	Mooltan	2,413	2,932	2,665	1,807	1,876	1,794	1,868	1,478
24	Jhang	924	986	886	619	500	455	678	481
25	Montgomery	1,371	2,193	1,624	1,199	990	957	1,164	936
26	Muzaffargarh	1,424	1,385	1,877	1,217	860	1,014	1,248	1,160
27	D. I. Khan	1,867	1,358	1,328	1,457	1,183	849	1,343	1,426
28	D. G. Khan	1,099	880	1,104	718	518	619	870	779
29	Bannu	855	601	603	719	589	476	635	627
30	Peshâwar	851	707	851	1,098	1,037	1,079	1,037	2,363
31	Hazára	1,285	904	1,145	880	973	737	899	1,589
32	Kohát	320	204	203	142	150	155	178	144
	Total ...	55,537	46,156	55,965	53,764	50,213	39,743	53,352	70,079

Mortality.

3rd Quarter.				4th Quarter.				Total.			
1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.	1875.	1876.	1877.	1878.
2,326	1,813	1,816	3,801	3,022	2,586	2,702	13,278	10,660	7,923	8,365	22,729
2,484	1,866	1,592	8,569	2,790	2,829	2,209	16,252	9,221	7,752	6,777	31,776
1,598	1,726	1,540	2,563	2,181	2,615	1,580	9,859	7,447	7,476	6,516	16,492
1,206	824	809	1,901	1,406	1,619	1,079	3,950	5,324	4,063	3,474	8,892
1,893	1,637	1,688	2,555	2,667	2,903	2,177	8,686	9,404	7,341	7,141	15,340
583	491	385	729	1,017	850	611	1,669	2,787	2,292	1,930	3,837
2,478	4,845	2,138	3,295	2,941	8,362	2,029	10,535	11,936	17,186	9,582	18,802
1,932	2,349	1,809	3,298	2,961	5,600	2,385	11,740	7,938	9,970	7,124	18,546
75	51	45	81	46	44	45	77	210	162	170	270
3,306	10,528	3,167	8,540	8,394	22,675	4,077	34,266	16,825	37,952	14,232	48,711
4,720	10,233	2,942	4,642	13,820	19,013	3,561	14,809	23,595	33,997	13,027	25,575
3,401	2,965	2,303	2,549	4,253	3,837	2,682	3,156	11,367	10,472	8,986	10,190
4,272	5,316	3,082	4,498	9,597	16,025	3,597	13,578	19,258	25,385	12,743	24,056
4,761	5,233	2,845	3,000	15,375	14,952	3,002	7,635	25,836	25,092	13,543	18,612
4,075	8,444	2,805	2,717	8,352	20,785	2,722	6,151	17,411	32,593	11,840	16,261
2,745	4,322	2,729	4,396	7,447	9,657	3,840	12,178	15,635	19,355	12,849	23,508
1,748	3,928	1,964	2,080	4,025	12,057	2,325	6,154	8,474	19,125	9,552	13,128
1,386	2,192	1,317	4,859	2,443	5,935	2,416	11,205	5,695	9,478	5,610	19,093
1,653	2,115	2,212	3,411	2,166	2,679	3,165	9,115	8,961	8,068	9,305	18,795
1,185	1,222	1,307	2,074	1,609	2,045	1,804	5,088	5,842	5,190	5,409	10,384
1,515	2,918	1,813	2,352	2,440	4,720	2,068	4,457	6,841	10,093	7,279	11,402
825	926	847	1,152	1,403	1,872	1,219	3,220	4,520	4,253	4,107	6,725
1,352	1,445	1,342	1,491	3,959	3,703	2,175	3,389	9,600	9,874	8,050	8,165
442	581	520	424	1,446	1,594	742	876	3,312	3,616	2,826	2,400
939	861	796	913	4,506	2,382	1,297	2,762	7,806	6,393	4,881	5,810
712	765	1,023	1,167	1,680	2,938	1,557	3,674	4,676	6,102	5,705	7,218
832	764	1,992	1,366	1,396	1,850	1,346	4,053	5,278	4,821	5,009	8,302
483	655	592	664	940	1,675	614	1,819	3,040	3,829	3,180	3,980
453	527	1,470	840	706	1,108	611	2,350	2,603	2,712	2,319	4,536
668	692	630	1,785	932	1,218	860	1,520	3,488	3,696	3,378	6,766
911	1,258	766	1,204	828	1,375	830	5,232	3,997	4,274	3,640	8,905
126	160	191	202	258	232	160	798	854	751	732	1,286
57,085	83,652	48,477	83,118	117,006	181,735	61,487	233,531	279,841	351,286	219,281	440,492

44. Owing to the absence of any data of a reliable nature it has been found impossible to classify the deaths registered under the head "fevers," though there are good grounds for believing that a very large proportion of the whole number of deaths returned under this generic term was the result of fevers of a specific kind. Very fatal epidemics of genuine typhus or spotted fever are known to have swept over the northern and western districts of the Province from Hazára in the north to Dera Ghazi Khan in the south. Relapsing fever has proved very fatal in the south-eastern districts, especially in the towns and rural circles to the south of Delhi. And cases of enteric fever have occurred here and there in most towns of the Province. Whilst pleuro-pneumonia, which is sometimes returned under the head of "fever" and sometimes under that "of chest diseases" (included in "all causes") has ranged over a very wide area as a most fatal epidemic during the last four months of the year.

A large proportion of the deaths registered under the head of fevers was the result no doubt of fevers of a specific kind.

Pleuro-pneumonia sometimes returned under the head of fevers.

With all this the malarious fevers, both intermittent and remittent, have held their ground, so far as one can judge with the scanty information available, much as usual, with here and there more than usual severity, especially in the towns of Jullundur, Firozpúr, Ludhiána, Lahore, Amritsar, and Delhi.

Nevertheless malarious fevers, have held their ground judging from the scanty information available.

45. In considering the causes of this great increase in the mortality from the diseases classed under "fever," it is necessary, before we attempt to devise any means to mitigate the severity of these diseases or to prevent their occurrence, to understand what their causes really are, and how far they are under our control or management. So far as our knowledge goes, the several causes which conduce to the production of fevers, or at all events to their development and growth when once produced, are divisible into three classes, *viz.*, those dependent on local conditions, those dependent on climatic conditions, and those dependent on accidental conditions. The first are of a constant character, the second of a periodic character, and the third of an exceptional character. And all three react the one upon the other. The local and constant conditions include all those various circumstances which together go to constitute the sanitary state of the place and its belongings. The most important of these circumstances are drainage, ventilation and conservancy (sewerage and scavenging), as regards the site; and shelter, food, clothing, and occupation, as regards its dwellers.

The causes which conduce to the production of "fevers."

They are: first, those dependent on local conditions; 2nd, those dependent on climatic conditions, and 3rd those dependent on accidental conditions.

46. The more perfect are these conditions the surer is the immunity not only from fever but from most diseases which thrive under the reversed conditions. And, moreover, they are to a greater or less extent under our control; some such as those affecting the place generally, including drainage, water-supply, conservancy, street and suburb ventilation &c., by municipal agency, or that of the State in special instances; and, others such as those affecting the individual and including domestic cleanliness and comfort, &c., by personal agency. According as these several sorts of circumstances are attended to and provided for, or are neglected and unprovided for, may we expect respectively an immunity from the evil effects of fevers and the kindred diseases, or their constant presence and fatal activity.

Drainage, ventilation, conservancy &c. come under the first cause (local conditions), which is under control.

47. Now if we look around and consider the actual condition of our towns we shall discover to how great an extent the attention due to these several circumstances (which experience has proved are essentially necessary to the maintenance of sound health not only of the individual but of the community at large) is habitually and generally neglected. It is true that during the past 12 or 15 years very great improvements have been effected in the sanitary surroundings of our towns; that broad and airy streets have been opened out in their quarters of public resort and daily business, and their conservancy been arranged for by an organized establishment; that splendid carriage drives and shady avenues have taken the place of the former miserable tracks and paths that offered the only approach from the outside, whilst pleasure gardens and boulevards occupy the suburbs. But all these improvements with their expenditure of money and labour have not operated in any appreciable manner to improve the health standard of the town population or to diminish their rates of mortality. The explanation of this fruitless result of expenditure of money and labour is in the fact of their incompleteness. All these costly improvements, excellent and beneficial as they are in their way, have proved useless in point of sanitary results simply because they have been stopped short just at the very threshold of the very places where they are most needed. They have surrounded the several centres of habitation with all that is nice and wholesome, but they have not touched these centres themselves. It is as it were making clean the outside of the platter whilst the inside is left full of all manner of uncleanness.

Actual sanitary conditions of towns considered in respect to drainage, conservancy &c.

48. By this I would not have it understood that nothing has been done to improve the sanitary defects of these inner habitation centres as distinguished from their public quarters. On the contrary, a great deal has been done so far as the expenditure of money and labour goes, and this is all that can be said, because the effort almost everywhere has been aimless and without method. Street pavements have been laid down in one spot on one plan, in another upon an opposite one; drains have been renewed, or laid down for the first time here and there piecemeal and haphazard without system or co-ordination; and what has been initiated by one set of authorities has been altered or reversed by their successors. And thus it is that no real progress has been made in improving or removing the radical faults in the sanitary condition of the

Municipal corporations to take up the subject of improving the sanitary conditions of towns with earnestness and soberness of purpose, and to carry out improvements on an organized system.

largest number of our towns. They have been treated as an old and worn-out garment, with mere patches here and there to preserve it from tumbling to pieces. It has not been by a procedure such as this that the improvements in the public quarters and bazárs of these same towns have been effected. If the dwelling quarters of our towns are ever to be put into a wholesome sanitary condition, the subject must be taken up with earnestness and soberness of purpose, by the several municipal corporations themselves, and not trifled with. Every town has its own peculiarities of condition in respect to soil, site, and water-supply, and each requires a special and separate study for the proper or most advantageous adaptation of the common principles of sanitation applicable generally to them all. And there are but few in which these common principles of sanitation cannot be introduced in a combined and efficient system by the unaided resources of the town itself. These common principles of sanitation are embodied in the several measures necessary to preserve cleanliness of the soil, wholesomeness of the air, and purity of the water. The first is the most important because, if properly provided for, it removes the most prevalent and active causes which operate to vitiate the good qualities of the other two essentials of a salubrious habitation. And the means of efficiently providing for this requisite cleanliness of the soil as best adapted to the existing circumstances of town-life in this country are :—

Suggestions for effecting improvements in towns on some recognized principle.

First.—Paved streets with open surface gutters at the sides, house drains connected with the street gutters, and outfall drains to conduct the sewage of the town to a distance away from its inhabited area; the whole to be upon a uniform and combined system complete in all its parts, and not as is now the case in a disjointed, irregular, and imperfect form, with surface gutters and underground drains at impossible angles and gradients, with house drains and sinks discharging broadcast over the surface, with streets half paved and drains ending abruptly on the surface of public roadways. To be of any use the system must be uniform and complete in all parts of the town. Underground drains should be abolished everywhere and replaced by surface gutters which can always be kept in a sweet and wholesome state by daily sweeping and flushing, for it must be borne in mind that the sewage they carry is not charged with fœcal matter as is that of European towns, or, at all events, if there be such matter mixed up in it, the quantity is comparatively very trifling in amount.

Conservancy establishment of some strength and organization needed.

Second.—A conservancy establishment of some strength and proper organization to perform the efficient scavenging of the town. In Section X, "General Remarks and Personal Proceedings" I have sketched out a plan which it appears to me is practicable for the thorough execution of this duty, and have drawn attention to the means of making it self-supporting, if not altogether at least to a considerable extent, by the monopoly of town sweepings, &c.

If the suggestions for preserving the cleanliness of the soil be fully provided, little will be required to preserve the wholesomeness of the air and purity of the water.

49. If the measures here indicated for preserving the cleanliness of the soil be fully provided, little will be required to preserve the wholesomeness of the air and purity of the water. In the former direction it will be enough to see that existing thoroughfares are not encroached upon as air passages or ventilators by walls or other obstructions projected from the houses on either side, whilst it will be necessary to open out blind alleys whenever the measure is practicable. In the latter direction, so far as concerns the town area, it will be necessary to make careful provision for the protection of the wells from surface impurities by parapets and drains in connection with the street gutters for the free flow of waste water and spillings; whilst, as regards the area outside the town, any sources of surface contamination, such as dung pits, stagnant pools, &c., must be abolished, and where the soil is water-logged, it must be drained.

Few towns only in which the suggestions above mentioned cannot be carried out on a comprehensive scale and system.

50. I have stated it as my belief that there are few towns in this Province in which these measures cannot be introduced on a comprehensive scale and system. By this I don't mean that it can be done by any budget provision of a single year, and I would deprecate the entertainment of such an idea, for its adoption would only lead to yet more profitless expense, and postpone indefinitely the attainment of a real sanitary improvement. But what I do mean is that almost every town is able on its own resources to raise a loan sufficient to meet the cost of at once putting it in a wholesome sanitary condition by a complete and thorough refit of its conservancy machinery. At the first glance the measure appears a much more costly and extensive work than it is in reality. But much of this appearance will vanish on closer enquiry, for it will be found that the greater part of most towns is already paved and drained, though in a disjointed, irregular and imperfect manner. What it is necessary to provide for now is the utilization by repair and addition of the machinery already in existence, which is not only useless, but absolutely harmful, by reason of its faults and imperfections. Under the patchwork and piecemeal system which has heretofore prevailed, I see no prospect of our towns ever emerging from the insanitary conditions which are the common characteristics of the whole of them. What is required now to put them in a proper sanitary state is an earnest effort in the direction above indicated on the part of the several municipal corporations. I would recommend that the several towns take up the subject without further delay, that the sanitary requirements of each be carefully investigated, that a plan of the scheme proposed for the improvement of each be prepared, and that after examination and approval it be carried out; if need be, with money borrowed for the purpose.

Until this, or something akin to it is done, no real improvement can be expected in the dwelling quarters of our towns nor in the health standard of the people exposed to the evil influences of their existing various sanitary defects.

51. The above remarks apply to those circumstances of sanitation which are under our control by municipal agency. There are others, equally important in respect to their influence upon health, which are only under control by personal agency. They include the various duties of the individual in respect to his domestic life and daily habits, and include such matters, as house ventilation, and conservancy, food, clothing and occupation. With the higher, middle, and upper lower classes, these several points are fairly attended to as matters of personal comfort and convenience, but with a strange mixture of right and wrong, of care, and want of care, which are the results of ignorance rather than of indifference. With the millions of the poor and labouring classes, however, it is just the reverse, their poverty and ignorance go hand in hand with improvidence and heedlessness. They are the people who most pollute our towns, and who to the greatest extent pay the penalty with their lives. In the case of the better classes we may look to education as one means of improving the character of the control by personal agency, but for those people so far as they affect the cleanliness of the town, the municipalities must provide by bringing their dwelling quarters under special supervision.

Other circumstances of sanitation equally important as those above mentioned but which are only under control by personal agency.

52. Such in the main are the circumstances which combine to constitute the constant and local conditions of a place in respect to its sanitary state, and upon their neglect or due observance will in a great measure depend its unhealthiness or healthiness. The existing evils of an imperfect sewerage and defective scavenging are well known, and have been described in detail in numerous reports. Their effect is to prepare the soil for the development and growth when once produced of fevers and kindred diseases, and by lowering the health standard of the people exposed to them to render them more liable to the assaults of disease of whatever kind. And this as the permanent character of the place and as the permanent liability of its people, so long as the evils are permitted to exist.

The healthiness or unhealthiness of a place depends in a great measure upon the observance or neglect of simple sanitary rules.

53. But more than this, like the field manured and sown for the advent of that combination of climatic or atmospheric conditions, such as temperature, humidity and electricity, which shall rouse its quiescent seed into the activity of germination, so the town soil similarly prepared awaits that second class of fever causes which as before mentioned is dependent on climatic conditions and is periodic in character. On every occasion of the suitable concurrence of this combination of atmospheric conditions fever starts into activity, the force and range of which is limited only by the force and range of its existing causes. And when in the ordinary course of the seasons the whole atmosphere is charged with this unknown, (except by its effects,) combination of conditions suitable to the growth of fever, that disease bursts out with unbounded activity and with greatest force in those places which are the most suited to its support by previous preparation.

The climatic conditions the second class of fever causes.

In some localities the constant evils of their sewage-saturated soil are added to, and increased by the accident of flooding on the surface or water-logging below it, and with a consequent intensification of the fever activity. The changes of climate and weather are beyond direct control, but their effects are not, whether these be considered as affecting the soil or the individual. In the former case the measures directly calculated to counteract or prevent these injurious effects of weather upon a soil impregnated with sewage matters, whether derived from an animal or vegetable source, have been already alluded to. They are good drainage and efficient conservancy (sewerage and scavenging) of the site. The soil of a town protected from impurities by such means will be like the field which is sown but not manured, and in which the seed will start into activity on the advent of its exciting causes, but will yield a poor crop for want of food. In the latter case the precautions necessary are those which conduce to maintain the individual body in an equable condition as regards its organic functions under varying circumstances of temperature and humidity in the general atmosphere. The most important of these is the precaution to protect the body against "chill," and this is best done by means of suitable clothing at all times and proper house shelter at night. It is the neglect of these precautions as regards the body, and the absence of free drainage and efficient provisions for protecting the soil from sewage impurities which operate as the most powerful and widespread agencies in fitting the bodies of the people for the activity and growth of fevers. And hence it is that when the periodic conditions of climate which favour their growth and spread, arrive in the full force of their seasonal intensity, the population *en masse* is prostrated by the disease and killed off by the thousand. And this is observed to be the case year by year all over the Province, and in utmost intensity during the season following the monsoon rains.

54. But besides the two chief classes of causes above mentioned, which conduce to the production of fevers, or to their growth when once produced, there is a third which happily is of exceptional character and accidental occurrence so far as concerns the general population as a whole, though it is by no means inoperative amongst certain sections of the people at all times. In this class are included famine, general distress, high prices and poverty. In the year under review, though there has not been an actual famine, the poorer classes have been much distressed for food, and have suffered unusual hardships in consequence. The mortuary returns show that the standard of public health has been low throughout the year irrespective of season or class of disease (see table of monthly mortality Section V page 2), and this it appears is the result of widespread poverty and distress for food which have reduced the bodily strength of the people to such a degree as to render them incapable of resisting the assaults of any disease going. Hence the uniform increase under all the several heads of disease excepting

Famine and general distress the third cause which conduce to the production of fevers.

only cholera. As an illustration of the reduced bodily strength of the people, I may refer to the epidemics of sloughing ulcers almost confined to the lower extremities and generally below the knee, which have proved so fatal amongst the poorer classes in Delhi, Rewári, Amritsar, Jullundur, Lahore, Ludhiána &c. &c. In the foregoing remarks I have spoken of fever in its generic sense without distinction of its types, either malarious or specific, because I have found it impossible to separate them in accordance with any peculiar condition of circumstances connected either with the soil or the atmosphere, though perhaps in the other conditions of life there are traceable some special characteristics, such as filth, overcrowding, deficient food and clothing, &c., which accompany the one class and not the other. That is to say, the malarious fevers, though most fatal amongst the poor classes, spare no class of the people, whilst the specific fevers are for the most part confined to the poorer classes, only here and there making an inroad upon the wealthy or well-to-do classes. But the two classes of fever are not unfrequently found together in one and the same place in epidemic violence, and it is often difficult to say which is remittent and which typhus, or where the malarious ends and the specific begins. Whether malarious or specific, contagious or not, the grave fact remains that "fever" is the most deadly and most baneful disease which we have to contend against in this Province, and to its banishment or subjugation must our efforts be directed. In the foregoing remarks I have endeavoured to point out the lines on which action should be taken towards the attainment of these ends both as regards the community and the individual. If what is recommended for the safety and well being of the community be carried out by our municipal corporations, then it may be surely predicted that the individual will quickly follow suit in adopting what is required by his personal interest.

Cases of typhus fever by Surgeon-Major R. Gray, given as an appendix.

55. In the appendix are given some interestiug cases of typhus fever reported by Surgeon-Major R. Gray, Civil Surgeon of Murree.

D.—BOWEL COMPLAINTS.

Districts in which the highest number of deaths occurred from bowel complaints.

56. Under the head of bowel complaints 32,071 deaths were reported to have occurred during the year against 17,664 in the previous year. The highest number of deaths from bowel complaints occurred as usual in the Gurgaon district, *viz.*, 3,828, giving a death-rate of 5·49 per 1000 of population. Next to Gurgaon are the districts of Simla, Delhi, and Hoshiárpur, in which the per mille ratio was 3·66, 3·41 and 3·13 respectively. In Karnál, Rohtak, Umballa, Ludhiána, Amritsar, and Hazára, it ranged between 2 and 3 per 1000; in all others it was below 2 per mille.

The months in which this disease rises and falls during each year in this Province.

57. February and March are the months in which the mortality from bowel complaints during the year under review was lowest, and October and November those in which it was highest. It will be seen by reference to the table showing the number of deaths from bowel complaints by months since 1869, given at pages 7 and 8 of the Sanitary Report for 1877, that the minimum number of deaths from bowel complaints in this Province occurs, as a rule, in the months of February and March, and the maximum, with rare exceptions, in September and October.

The towns in which a high death-rate occurred from the disease.

58. The urban death-rate from bowel complaints in the Province during the year 1878 was 6·73, and the rural 1·44. The following towns suffered very severely, as will be seen from the death-rates given opposite each:—

	Death-rate from bowel complaints per 1000 of population.		Death-rate from bowel complaints per 1000 of population.
1. Palwal ...	41·25	8. Farukhnagar ...	13·31
2. Firozpur ...	23·55	9. Hoshiárpur ...	12·10
3. Ludhiána ...	15·35	10. Hissar ...	12·43
4. Pind Dádan Khan ...	14·94	11. Jagraon ...	11·27
5. Rawalpindi ...	14·81	12. Kaithal ...	10·32
6. Rewári ...	14·25	13. Pesháwar ...	9·74
7. Umballa ...	13·82		

E.—INJURIES.

Deaths from suicide.

59. The total deaths from suicide were 268 against 197 in the year previous, and the districts in which the highest number occurred were Gurgaon, Kángra, Hoshiárpur, and Amritsar. In these districts alone a little less than one-half of the total number was registered.

The number recorded amongst males and females from the different modes of committing suicide was as follows :—

	Males.	Females.	Total.
Drowning ...	26	48	74
Hanging ...	58	66	124
Poisoning with opium ...	19	9	28
Do. with arsenic ...	9	8	17
Cutting the throat ...	1	1	2
Gun-shot wound ...	2	...	2
Falling from heights ...	2	4	6
Causes not stated ...	4	11	15
Total ...	121	147	268

Deaths from accidents.

60. Under the general heads of accidents 4,392 deaths occurred, compared with 3,595 in the preceding year, thus :—

	Males.	*Females.*
Drowning	1,465	1,177
Crushed under and falling from roof, trees &c. ...	859	367
Killed by lightning	38	6
Burns	142	140
Hurts caused by kicks from horses &c. ...	54	12
Causes not stated and other causes	112	20
	2,670	1,722

Highest number from accidental drowning occurred amongst females in the Gurgaon district.

Of the 1,177 female deaths from accidental drowning, 526 were drowned in wells, 261 in tanks, and 134 in rivers and streams. Of the remaining 256 deaths, the causes are not mentioned. A little less than one-fifth (*viz.*, 205) of the total number, however, alone occurred in the Gurgaon district, 37 of the number being under, and 168 over 12 years of age.

Deaths from snake-bite and hydrophobia.

61. The total mortality from snake-bite and killed by wild beasts &c., was 866, of which 752 and 85 occurred from snake-bite and hydrophobia respectively. The number in the past year from these two causes was 832 and 157. A little less than two-thirds of the total deaths under the head of snake-bite occurred in the districts of Lahore, Gujránwála, Rawalpindi, Kángra, Jhelum, Shahpur, Mooltan, Jhang, Montgomery, Muzaffargarh and Dera Ismail Khan alone. Of the deaths from hydrophobia the highest numbers registered in any one district were 16 in Lahore, 11 in Gujránwála, and 8 in Karnál. In none of the other districts did the number exceed 6. In six, only single deaths have been registered.

SECTION VII.

See Vaccination Report, attached.

SECTION VIII.

No Remarks.

SECTION IX.—SANITARY WORKS—CIVIL.

Income and expenditure of the Municipal towns in the Province.

62. The income and expenditure of the Municipal towns in each district of the Province during the year 1878 will be seen from the subjoined provincial statement compiled in this office from the returns received from Deputy Commissioners :—

Table Showing the Income and Expenditure of the Municipalities

Number.	Name of Districts.	Balance from previous year.	Actual income for the year.	Total.	Expenditure on Sanitary						
					Conservancy establishment.	Paving.	Roads and bridges.	Drainage and sewerage.	Water-supply, including clearing and repairing of wells, tanks, &c.	Widening of streets.	Constructions of latrines.
1	Delhi	15,504	2,25,760	2,41,264	28,589	...	21,573	2,440	1,042	...	761
2	Gurgaon	19,240	47,314	66,554	6,093	367	1,880	272	1,669	..	...
3	Karnál	11,739	37,550	49,289	7,546	775	2,799	60	820	...	...
4	Hissar	37,272	42,686	79,958	12,148	871	2,668	493	3,339	...	327
5	Rohtak	15,486	26,965	42,451	4,191	96	4,064	319	805	427	200
6	Sirsa	16,249	40,232	56,481	3,330	...	2,332	84	366	...	391
7	Umballa	23,028	59,473	82,501	11,259	1,424	7,073	820	1,323	...	418
8	Ludhiána...	38,117	64,855	1,02,972	11,105	1,217	3,436	1,292	449	...	...
9	Simla	...	...	...	...	...	...	...	...	...	...
10	Jullundur...	16,802	56,257	73,059	11,176	1,541	2,145	2,663	184	...	...
11	Hoshiárpur	18,403	43,977	62,380	8,603	3,676	769	121	2,814	...	60
12	Kángra	7,416	16,997	24,413	1,377	1,025	1,914	...	649	...	205
13	Amritsar	1,49,841	4,06,605	5,56,446	42,171	400	21,644	6,326	4,347	3,573	...
14	Gurdáspur	7,707	47,010	54,717	6,558	952	578	679	97	...	...
15	Siálkot	3,237	36,652	39,889	4,752	804	448	758	66	...	...
16	Lahore	67,545	1,82,525	2,50,070	32,225	697	37,228	...	201	200	270
17	Gujránwála	20,794	44,267	65,061	5,667	4,041	2,441	2,126	808	107	...
18	Ferozepore	20,521	40,809	61,330	4,610	...	8,544	1,033	390	...	...
19	Rawalpindi	26,405	73,273	99,678	9,689	254	15,582	215	1,914	...	...
20	Jhelum	11,214	58,561	69,775	5,146	2,089	4,697	280	2,181	...	557
21	Gujrat	5,540	16,302	21,842	4,261	235	75	168	372	...	...
22	Shahpur	16,658	34,807	51,465	4,693	1,625	452	203	2,523	...	...
23	Mooltan	55,319	95,921	1,51,240	13,908	1,757	8,716	805	808	...	...
24	Jhang	5,280	29,681	34,961	5,252	915	408	584	2,871	...	...
25	Montgomery	5,660	9,707	15,367	1,973	108	551	1	460	...	83
26	Muzaffargarh	7,448	16,639	24,087	2,458	2,115	85	239	321	...	...
27	Dera Ismail Khan	23,042	51,800	74,842	9,696	6,500	1,447	2,313	573	...	120
28	Dera Gházi Khan	7,091	43,806	50,897	7,352	1,400	2,502	1,616	1,234	...	65
29	Bannu	10,051	25,613	35,664	4,877	1,058	222	824	17	1,150	50
30	Pesháwar...	1,352	1,31,945	1,33,297	15,263	...	3,962	6,918	705	1,489	...
31	Hazára	1,250	12,753	14,003	1,695	...	1,275	...	85	...	...
32	Kohát	5,486	15,836	21,322	1,260	...	26	5,026	30	132	...
	Total ...	6,70,697	20,36,578	27,07,275	2,88,923	35,942	1,61,536	38,678	33,463	7,078	3,507

in each District of the Punjab, during the year 1878.

Works.		Expenditure on other heads.							Remarks.
Repairs of do.	Total Sanitary charges.	Vaccination.	Dispensaries.	Police.	Schools.	Miscellaneous.	Total expended.	Balance unexpended.	
62	54,467	846	11,683	67,293	7,088	94,859	2,36,236	5,028	
61	10,342	232	10,067	11,512	5,290	12,194	49,637	16,917	
104	12,104	...	2,164	15,467	2,164	11,010	42,909	6,380	
247	20,093	...	5,095	15,605	1,498	4,775	47,066	32,892	
173	10,275	...	1,385	7,352	2,107	8,775	29,894	12,557	
100	6,603	...	2,380	5,735	3,237	12,181	30,636	25,845	
927	23,244	527	4,380	13,430	2,646	13,108	57,335	25,166	For the Financial year 1878-79.
225	17,724	36	7,876	13,511	5,470	13,500	58,117	44,855	
...	...	...	...	...	...	...	...	...	Details not given according to prescribed headings.
548	18,257	...	5,842	14,885	8,006	12,048	59,038	14,021	
24	16,067	...	2,394	10,160	2,395	17,434	48,450	13,930	
...	5,170	..	3,871	2,928	1,829	4,407	18,205	6,208	
767	75,228	255	29,732	54,939	10,532	2,02,908	3,77,594	1,78,852	For the official year 1878-79.
...	8,864	...	5,290	9,974	6,417	11,165	41,710	13,007	
192	7,020	31	3,890	9,577	2,731	11,440	34,689	5,200	
115	70,936	924	6,534	42,287	5,844	51,098	1,77,623	72,447	
9	15,199	...	4,562	10,008	6,864	10,895	47,528	17,533	
1,951	16,528	...	4,497	7,686	4,359	10,056	43,126	18,201	
178	27,832	...	13,029	12,549	3,125	16,709	73,244	26,434	
238	15,188	...	4,611	10,656	1,577	17,860	49,892	19,883	
50	5,161	...	1,302	6,667	697	4,882	18,709	3,133	
196	9,692	...	5,139	9,390	3,697	5,731	33,649	17,816	
...	25,994	...	5,095	19,053	4,109	20,612	74,863	76,377	
216	10,246	120	4,128	5,966	2,736	7,667	30,863	4,098	
...	3,176	...	2,602	1,918	1,057	2,704	11,457	3,910	
23	5,241	...	2,012	3,855	1,249	6,226	18,583	5,504	
...	20,649	...	6,550	8,145	3,192	23,663	62,199	12,643	
86	14,255	...	3,805	6,139	2,650	11,500	38,349	12,548	
23	8,221	...	2,147	10,880	1,162	10,363	32,773	2,891	
59	28,396	262	7,265	29,219	2,070	58,138	1,25,350	7,947	
93	3,148	...	484	3,704	464	4,397	12,197	1,806	
...	6,474	...	318	3,297	100	4,500	14,689	6,633	
6,667	5,75,794	3,233	1,70,629	4,43,787	1,06,362	6,96,805	19,96,610	7,10,665	

63. The expenditure for sanitary purposes amounted in the aggregate to Rs. 5,75,794 or 21·2 per cent. of income—

On Vaccination	Rs.	3,233	or 0·1	per cent. of income
„ Dispensaries	„	1,70,629	or 6·3	do. do.
„ Police	„	4,43,787	or 16·4	do. do.
„ Schools	„	1,06,362	or 3·9	do. do.
„ other requirements ...	„	6,96,805	or 25·7	do. do.

Expenditure for sanitary purposes during 1878 and 1877 compared.

64. A detail of the expenditure for sanitary purposes during the year under review is contrasted with that spent in 1877 thus :—

Sanitary purposes.	Expenditure on Sanitary purposes.		Percentage of expenditure on sanitary purposes to total income, including balance of previous year.	
	1877.	1878.	1877.	1878.
Conservancy	3,03,267	2,88,923	11·8	10·7
Paving	60,533	35,942	2·4	1·3
Roads and bridges and streets	1,77,614	1,68,614	6·9	6·2
Drainage and sewerage	90,433	38,678	3·5	1·4
Water-supply, tanks, &c.	41,034	33,463	1·6	1·2
Construction and repairs of latrines	11,602	10,174	0·5	0·4
	6,84,483	5,75,794	26·7	21·2

I need only reiterate here what I mentioned in para. 107 of my report for last year, that "it should be a recognized rule, and acted up to, that all matters of direct sanitary improvements or benefit should have precedence of all others not of that character."

Sanitary progress in the Municipal towns of the Province by districts.

65. The following is a brief history of the sanitary progress made during 1878 in the Municipal towns of the Province, extracted from the reports received from the Deputy Commissioners and Civil Surgeons :—

DELHI.

Names of municipal towns.	Population census of 1875.	Income in 1878, including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Delhi ...	1,60,553	2,15,160	47,572	22
Sonepat ...	13,637	13,132	3,658	28
Ballabgarh ...	6,671	4,606	1,320	29
Faridabad ...	7,583	4,154	1,047	25
Najafgarh ...	4,309	4,212	870	21

Details of sanitary works not submitted by Deputy Commissioner.

Extract paras. 5 and 8 of No. 1830, dated 16th April 1879, from Secretary to Government, Punjab, Public Works Department, to address of Sanitary Commissioner, Punjab, regarding the water-supply of the city and fort of Delhi is herewith annexed.

Para. 5.

"With respect to the scheme for the water-supply of the city and fort of Delhi after a careful analysis and investigation of the water obtained from trial wells sunk in the bed of the Jumna opposite to the city on the sites originally proposed, it was found that this source of supply was not free from sewage contamination, and after further trials above the city and burning ghat a site for the supply wells has been found, the water of which after analysis would seem to be good. Should it be practicable to use this source of supply the estimate will be re-cast, and it is hoped a commencement may be shortly made to carry out this most necessary work.

Para. 8.

"The Government of India having ordered, in the interests of the European troops quartered in the fort of Delhi, the diversion of the sewage which passes under the walls of fort Salemgarh from the outfall of the canal to be taken up by this Government. Instructions have been sent for the preparation of a project to effect this object and also to form a part of the complete scheme of sewage of the city of Delhi, which is to follow the completion of a water-supply."

GURGAON.

Names of municipal towns.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary purposes in 1878.	Percentage of expenditure on sanitary purpose to total income.
Farukhnagar ...	10,594	6,588	1,066	16
Rewári ...	25,190	45,354	6,855	15
Ferozepur ...	10,530	6,245	878	14
Palwal ...	13,553	8,367	1,543	18

A conservancy overseer has been appointed in each of the four municipal towns; and in Farukhnagar, where the appointment is held by a Mr. Mendez, the result has been a very marked improvement in the condition of the latrines, the town, and its environs; but, in other places the members of committee and the most influential residents are often the greatest offenders against sanitary rules, and the overseer, as a servant of the committee, is afraid to proceed against them, and the anticipated improvement has been only partially realized. A *punchayat* has been organized at Hassanpur for superintending conservancy arrangements in the town.

A large tank at Hodal, between the town and police-station, where waste water from the canal used to stagnate, has been filled up. Several of the excavations nearest to the town of Palwal have been levelled, and arrangements have been made for confining within a smaller area the water of several tanks near the wells which are too large to be filled up. Covered latrines for males, in which the dry earth system is to be carried out, are in course of construction at Rewári, and arrangements are in contemplation for improving the female ones. An improved slaughter-house has been projected. Carts for removing to a distance the town sweepings have been ordered. All the latrines of Jacombpura and the Saddar bazár at Gurgaon have been roofed, and the dry earth system introduced, and the arrangements placed under the supervision of the Civil Surgeon. The Municipal Act has now been extended to the towns of Gurgaon, Nuh, and Hodal.

KARNAL.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary purposes in 1878.	Percentage of expenditure for sanitary purposes to total income.
Karnál	24,015	19,901	5,405	27
Kunjpura	5,049	2,608	148	6
Púndri	5,433	1,307	197	15
Kaithal	15,799	10,543	3,130	29
Panipat	24,500	14,930	3,224	21

For conservancy the municipalities are altogether dependent on the establishment kept for the purpose. Surface cleanliness is well enforced in the three largest municipalities. In Kunjpura it is not so satisfactory owing to the want of pavements and the moistness of the soil; whilst in Púndri, owing to the smallness of the municipal income, an adequate establishment cannot be maintained. In all the towns the municipal sweepers have hitherto disposed of the sweepings to their own advantage. On this subject the Deputy Commissioner remarks that "an attempt has just been made in Karnál to secure this source of income for the Municipality, and if it succeeds without its involving a large increase to the cost of the establishment, it will be introduced elsewhere."

In Karnál, in consequence of the suggestions of the Sanitary Commissioner who visited the district in January 1878, Rs. 2,600 were expended in repairing with *kunkur* the street of the principal bazár, and one of the smaller bazárs, properly shaped drains being constructed on both sides with bricks laid in cement; a beginning of the same work was made by repairing the "charbaoo" street at a cost of Rs. 600. The work of repairing the streets in a suitable manner in Kaithal has been in progress for the last three years, and a work commenced there estimated to cost Rs. 1,720 was finished this year. An attempt was made and is still being persisted in, to secure the sweepings for the Municipal Committee, instead of permitting them to continue the perquisite of the sweepers.

More attention has been paid to the state of the public latrines. It was proposed to build new ones on a plan supplied by the Commissioner of the Division, but for want of funds the proposal had to be abandoned.

The slaughter-house at Pánipat was improved by extending the pavement and removing the earth on the surface, supplying its place with fresh earth. An attempt was made to remove the slaughter-house at Karnál to a different site, but this was found impossible, as its existence elsewhere would interfere with the prejudices of the Hindus.

HISSAR.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Hissar	14,162	12,053	3,725	31
Hánsi	12,210	6,654	2,558	38
Bhiwáni	33,220	56,996	13,065	23
Fatahabad	3,084	2,120	376	18
Rattia	3,120	1,033	216	21
Tohána	3,445	1,103	153	14

The water-supply is both good and sufficient.

In the town of Hissar 29 pucca wells have been cleared and repaired at a cost of Rs. 172.

The Western Jumna Canal flows in close proximity to the town, and there are 7 tanks fed from this source where the water is reserved for drinking purposes, other tanks being set apart for the watering of cattle and for washing clothes.

At Hánsi, 8 wells which supply drinking water have been cleaned and repaired at a cost of Rs. 58. Here, too, a branch of the canal runs close to the town, 4 tanks being reserved for drinking purposes, and others for the use of cattle and washermen.

At Bhiwáni there were 31 drinking wells which are always kept in proper repair, and are cleaned out once a year at a cost of Rs. 77. There are likewise 4 tanks set apart for drinking, watchman being stationed to protect them from cattle and other sources of pollution. Separate tanks are allotted for watering cattle, and washing arrangements are likewise distinct.

At Fatahabad there are 6 pucca wells for the use of the inhabitants which are maintained in good order, and also a tank. The small towns of Rattia and Sohána have also 3 or 4 wells, the water of which is said to be good and palatable.

Two large and deep excavations within the municipal limits of Hissar, where water used to lodge, have been levelled and filled up at a cost of Rs. 130. Four of the side drains where the road was *katcha*, have been paved with metal at a cost of Rs. 166; a section of one of the street roads has also been paved with bricks on edge. All the town roads have likewise been repaired at a cost of Rs. 341. The drains and water courses were cleaned out and put in order for Rs. 99, and 4 of the latrines were repaired for Rs. 97. All the canal cuts within municipal limits being cleared of silt and weeds periodically. At Hánsi 2 new latrines have been built just outside the Bursee and Kootah gates of the town at a cost of Rs. 377. A large *pucca* masonry drain has been built for carrying off the filthy drainage of the town at a cost of Rs. 139. The usual annual repairs to the town roads, bridges, and drains have likewise been executed at a cost of Rs. 635.

At Bhiwáni 3 sections of the city *katcha* road have been paved with bricks on end, at a cost of Rs. 1,000, a *pucca* drain to carry off filthy drainage has been built at Rs. 170, repairs have also been made to other town roads, bridges, drains, &c., at a cost of Rs. 1,625. The latrines have likewise been put in order for Rs. 150.

At Fatahabad, the city drains, roads, bridges, &c., have been repaired at an expenditure of Rs. 130, but at Rattia and Sohána no expenditure was incurred under these heads for want of funds.

ROHTAK.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works, in 1878.	Percentage of expenditure on sanitary works to income.
Rohtak	14,994	6,505	1,659	25
Beri	9,205	12,811	1,643	13
Gohána	7,296	6,655	1,530	23
Kharkhauda	4,185	2,621	487	18
Bahádurgarh	7,127	6,481	1,718	26
Jhajjar	12,456	7,378	3,238	44

The water-supply is from all sources.

Jhajjar and Beri municipalities spent Rs. 805 in repairing and improving tanks.

The district fund committee contributed Rs. 475, as a grant in aid to public spirited persons who had constructed wells for the benefit of travellers on public thoroughfares. There were 5 such wells. The sum of Rs. 2,200 also was contributed by the said committee for cleaning out and improving 16 tanks, 7 of them were completed during the year. A fine deep tank was excavated at Bahadurgarh, and is filled by means of a cut from the canal. The municipal and district committees had contributed Rs. 1,479, for both works, *i. e.*, the excavation of the tank and the canal cut.

In Rohtak town Rs. 604 were spent in metalling and repairing streets, and Rs. 26 in repairing latrines.

In Jhajjar Rs. 1,777 for metalling and repairing streets, and Rs. 6 for repairing latrines.

In Beri Rs. 380 for constructing a bridge, and Rs. 55 for repairing latrines.

In Bahadurgarh Rs. 980 on metalling and repairing of streets and repair to pavements, Rs. 177 for levelling and repairing of lanes and drains.

In Kharkhauda Rs. 200 for construction of latrines, and Rs. 50 for repairing and levelling unmetalled drains.

In Gohána Rs. 982 for repairing pavement and latrines, metalling a street, and making a drain.

SIRSA.

Municipalities	Population according to census of 1875.	Income in 1878 including balance of previous years.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Sirsa	12,807	22,705	3,946	17
Rânia	4,917	1,335	120	9
Ellenabad	3,299	2,209	187	8
Rori	2,728	704	72	10
Fázilka	4,346	29,528	2,278	8

The town sweepings are collected in certain fixed places in the town, and are taken from thence by the conservancy establishment before 10 A. M. and between 2 and 3 P. M. to be used in burning bricks at a distance of about 200 paces from the town.

The latrines to the north of the town have been roofed and the seats therein replaced by *gumlahs* filled with dry earth. A trough has been added to the tahsíl wells.

In the town of Fazilka some of the streets have been raised to facilitate surface drainage.

The Sanitary Commissioner visited the district in October 1877, and in accordance with his suggestions a scheme for the drainage of Fázilka is under consideration with reference to the remarks of the Executive Engineer on the plans and estimates submitted to him.

Instructions were issued at the beginning of last year directing the sweepings of the village to be collected in walled enclosures, and to be thence removed to a distance of 200 paces from the village.

UMBALLA.

Municipalities.	Population according to census of 1875.	Income in 1878-79 including balance of previous years.	Expended on sanitary works in 1878-79.	Percentage of expenditure on sanitary works to income.
Umballa	26,258	23,271	9,080	39
Jagádhri	12,522	17,260	5,579	32
Bâriya	8,197	4,643	512	11
Ládwa	4,121	4,746	524	11
Pihowa	3,569	1,587	288	18
Shahabad	11,660	3,510	815	23
Thánesar	7,111	3,805	928	24
Radaur	4,098	1,992	201	10
Sádhaura	11,167	5,978	606	10
Kharar	4,847	5,168	1,633	31
Rûpar	10,261	10,541	3,078	29

In all the Municipalities the drinking wells have been cleaned out as far as practicable.

In the Municipality of Umballa 42 sweepers, 10 *pakhalis* for taking away dirty water from the cess-pools, are kept. A jamadár supervises the conservancy work. In the other Municipalities also, the conservancy work is carefully supervised.

The streets and mohallas are apportioned out and assigned to the different sweepers, and the members of the committees go round the towns and inspect all the streets to see that they have been properly cleaned. At head-quarters the Deputy Commissioner and Secretary of the Municipal Committee frequently inspect the city of a morning. The only conservancy improvements for the sewerage in towns have been at Jagádhri where a drain at a cost of Rs. 147 was constructed from the octroi chowki to the Chachhroli gate or exit point, also a second new drain from the house of one Isrí carpenter to the Shahid gate, costing Rs. 118, also a new drain in the Garhie gate bazár costing Rs. 225.

New latrines both at Jagádhri and Kharar were constructed at a cost of Rs. 263 and 155, respectively. In the other municipalities there have been no new works affecting sewerage arrangements though all the existing drains have been kept in as good repairs as the funds of the town would admit of.

The Sanitary Commissioner visited this district in January 1878, the following action has been taken by the Municipal Committees consequent on his remarks and suggestions. New cess-pools wherever constructed have been built higher than before, *viz.* above the surface and cess-pools in the main thoroughfares, and principal streets have had wooden covers put to them. Glazed earthen-ware receptacles have been brought into use in the latrines.

SIMLA.

The folliowing report by Captain R. P. Nisbet, Deputy Commissioner and President Municipal Committee, on works in progress at Simla, dated 31st March 1879, and the remarks of the Secretary to Government, Punjab Public Works Department, thereon are herewith appended :—

1. The carrying out of the new water-supply is entirely in the hands of the Department of Public Works.

2. The Municipal Committee earnestly trust that the lengthy consideration that has been given to this subject will, now that a scheme has been decided on, soon develope really practical results. The construction of large tanks will, no doubt, take time ; but long before these can be complete, water might be brought into Simla, and the town reap the advantage pending arrangements for storage in reservoirs or the delivery of the water in various directions through service pipes.

3. Long before the reservoirs are ready, in fact as soon as the pipes can be laid from the source of supply to the Church, and the mains continued east and west to Boileau-ganj and Chota Simla, the Municipality will, besides the large reservoir at Combermere bridge, have a number of iron receiving tanks ready at convenient distances along the principal thoroughfares, which may be kept constantly full of water from the pipes. There will, in this way, be storage capacity for 75,000 gallons of water, and any surplus can be allowed to run off into the nearest ravine, as storm waters do at present.

4. The dearth of water and the exhaustion of the existing means of supply, which seem to threaten this year owing to the failure of the winter snow and rain, are a source of great anxiety, at least to me, which I hope the early completion of the new supply will never suffer to recur.

5. The principal object is to bring more water into Simla as soon as possible, which can be done before the works in full detail are complete. The pipes might probably be laid and water brought to Sangali by November next, when the work of pipe-laying can be continued all the cold weather on the roads in Simla itself, as unfortunately, work cannot be carried on during summer within Municipal limits without a most unreasonable and unnecessary vexation of the public. The Municipal Committee, at whose expense the project is being carried out, will only be content if the pipes are fully laid and water delivered in Simla before the return of Government and visitors to Simla in 1880.

6. With regard to the conservation of the old sources of water-supply in Simla, regarding which the Government desire to be informed, I desire first to express a strong opinion that for two years past, during which a large Engineering Staff has been located at Simla, preparing the project of new water-supply, it should have been a first instruction to the Superintending Engineer deputed to this special work, to place the ordinary and existing sources of water-supply at Simla on the best possible footing, which, with the Executive and Assistant Engineers and subordinate establishment of the Imperial Circle, might have been done without difficulty, and at a small cost, and not have materially interfered with the proper deliberations to secure a larger supply in the future, while the result in the present would have been immediately and eminently practical.

7. As no assistance in this way has been given, it remains for me to say what has been done, though in view of the project the Engineers of the Imperial Circle had in hand, and which it was hoped would have been commenced much earlier, the general opinion seemed to be that it was useless incurring very considerable trouble and expense with the existing sources of supply which had sufficed hitherto, albeit with increasing difficulty for the last few years.

8. The main source of water-supply at Simla is that at Combermere bridge. Few persons probably are aware how the supply is furnished. The water is drawn from springs through four tunnels bored into the hillside, and at a considerable distance from the point of delivery. Last year, on examining these tunnels, I found them in a very neglected condition ; all had fallen, and were choked with débris nearly their whole length, as it now proves, and they are said to have been in this state since 1873. One of these tunnels which furnished the principal supply, had 400 feet of 9-inch piping in it. How as much water as did find its way by percolation through the hillside and tunnels choked with rubbish is a marvel. Mr. Macnabb, a former Deputy Commissioner of Simla, now Commissioner of Umballa, drew my attention to the advantage of looking after the tunnels, which therefore I ordered to be cleared out and shored up. The work was done with the Committee's ordinary establishment, and has taken time ; the sides and roofs of the tunnels have been supported, and they are now open. The supply of water sensibly increased as the débris was removed. Until the tunnels were clear, it was not easy to say what more could be done. It is, however, evident to any one who examined them that from the porous character of the floor of these long tunnels, a very large quantity of water must have been lost by absorption before ever it reached the basin from which the water-carriers draw. Again, three of these tunnels had no doors, and being open some little distance from the entrance, they have afforded most convenient cover to the hundreds of persons coming to draw water, and they were merely a public latrine, as the condition they were in proved, and the defilement of the principal source of water-supply must have affected its purity ; a guard has been kept while work has been in progress, and the tunnels will now all be closed with doors. Having cleaned these tunnels, 3,000 feet of piping, which has just arrived, will be laid down in them, and the water of all the springs caught in the pipes, which will then be connected and led into the large reservoir.

9. No. 1 tunnel is 800 feet long ; here a dam of strong brick-work and cement will be erected, 100 feet from the spring, so that there shall be no possible interference with the spring itself ; the rock immediately round is hard, so a natural reservoir is formed ; a two-inch pipe in a perforated iron box is inserted behind the dam, and 700 feet of piping conveys the water to the mouth of the tunnel. In 1863, 400 feet of 9-inch piping was laid in this tunnel, but this only carried the water part of the way ; such pipes were absurdly large for any possible quantity of water there could be, and the expense was probably prohibitive, and led to the abandonment of the work. A two-inch pipe is ample to carry all the water the spring can afford.

No. 2 tunnel, which is 762 feet long, will be treated almost similarly, and piping laid down its whole length ;

No. 3 tunnel is 346 feet long ; and

No. 4 tunnel is 500 feet long, and will both be laid with iron pipes.

10. There was a 5th tunnel under the Rookery, but the spring here was a failure.

11. These tunnels are mentioned in a very discouraging way (and which prevented my moving in the matter earlier) in para. 12 of the proceedings of the Committee that reported on Simla in 1875 ; but if the subject was then fully examined, I venture to think it was perhaps too curtly dismissed.

12. The tunnels were then closed, and no correct conclusions could, I think, have been arrived at under such conditions as to their proper value. In any case, the fact remains that the springs are in the tunnels, and though the supply from one failed, the others have continued to furnish the main water-supply of Simla, and the result of clearing the tunnels has certainly been to maintain a flow of water, which, I am assured, after such a very exceptional water as we have had, without snow to replenish the springs, must have ceased if the tunnels and the springs had remained choked.

13. The tunnels will now all be closed with doors. Stop-valves and gauges will be fixed on the pipes just inside the doors to measure and regulate the supply of water. Hitherto, though the supply has been largely drawn upon all day, it ran to waste all night ; now with the dams in the tunnels and the stop-valves on the pipes the water can be held up all night, and when freed at day-light in the morning, gives a head of water which in this drought is most unexpected and valuable, and little or no waste of water occurs.

14. With iron piping laid almost up to the springs it does not much matter, nor can it interfere with the supply, if the tunnels, as always might occur, fall in ; but being now clear, I hope they will be constantly looked to, repaired and kept open.

15. The whole of the pipes from the tunnels will be joined in one main above the large reservoir at Combermere bridge into which the water will be delivered. This reservoir, which was lying idle, was brought into use last year, and water carried from it by direct flow to the market and slaughter-houses. It is now being put in thorough repair, and will be ready in a few days ; it has been raised three feet all round, and will now hold 45,000 gallons. The water being delivered free from any chance of pollution into the reservoir, will be drawn from it by taps, of which a large extra number are being put in at separate distances, so that Hindûs and Muhammadans may have their own. There are two other smaller reservoirs here, both broken down, which will

be built up and covered in, and such arrangements made that in event of any one of the three reservoirs being out of repair, it can be closed, and the water still drawn from the other two. The total storage capacity at Combermere bridge will be for 60,000 gallons, or nearly a week's supply of the quantity of water usually drawn here.

16. I think there is every reason to hope that the measures I have related will secure a much purer and larger supply of water than heretofore from the ordinary and principal source of supply at Combermere bridge.

17. There is a fine spring of water at the back of Jakko near Barnes Court, which will receive immediate attention. It is proposed to cover the spring at its source at Longwood, putting a door over a small reservoir and carry the water in iron pipes to the present delivery basin on the Mall Road. This is really the only way of insuring its protection from pollution, or to prevent its diversion before it reaches the reservoir.

18. All the other *baolis* or reservoirs at springs in Simla have been carefully cleared out, and, where necessary, repaired.

19. I regret the measures now in progress to increase the ordinary water-supply and insure its purity were not undertaken earlier, and there is no saying with careful treatment how much the supply might increase. If out of the large sum of money to be laid out on the new water-supply a tenth part had at once been expended by the Engineers of the Imperial Circle on the existing sources of supply, very valuable results would certainly have been obtained and proved of the utmost service, while the new works are in progress, or for some years until they are complete, though such assistance could never have dispensed with the new water-supply.

Conservancy.

20. The measures for the improved conservancy of Simla organized last year were, in the opinion of the Committee, very successful, and most beneficial to the health of the station. The arrangements were inspected by many officers of Government, including three Sanitary Commissioners, who reported quite favorably of them to Government. Further efforts have been made to perfect the arrangements this year, and the result will be, I doubt not, to make them as workable as scavenging can ever be, or as good as any conservancy possible in Simla under the existing conditions and short of a complete system of pipe drainage.

21. The provision of a well built latrine for the use of the natives resident in every compound in Simla where there was room for it, and under daily inspection to see it was clean and in proper order, was a change for the better on previous arrangements which cannot be gainsaid.

22. The construction of commodious, decent and well served public necessaries in situations still retired, yet within easy reach of the bazár and the people for whose use they were intended, provided for a much felt public want. Indeed, the way the people availed themselves of such accommodation was so far beyond any previous experience in Simla that the Committee's establishment and means, though largely increased, threatened to break down, but by dint of exertion and the supply of more men and material no failure occurred, and the new system worked thoroughly well all the year.

23. Sixteen public latrines of the new pattern, 11 double and 3 single, with altogether 216 seats, were constructed and in use.

24. Eleven new ones have been built during this cold weather, and will be brought into use immediately, so that the station is now well fortified in this respect. It is amply proved that the people will use these places if made comfortable and convenient for them, and the good effects such a provision must have in saving the ground from promiscuous pollution and benefitting the general health will hardly be denied. During this winter substantial dwelling-houses have been constructed for the Municipal conservancy establishment immediately in the vicinity of the public latrines.

25. Unless the persons employed in cleaning these places live close at hand, their work is neglected; they spend half their time at their homes, and are never to be found. Again, the herding together in most wretched hovels of persons of their class was a source of danger to the community. The provision of good quarters for this establishment was, I consider, most necessary.

26. Sweepers are a most difficult class to manage, especially several hundred of them. They are of course not the least to be trusted, and a constant war of supervision has to be waged with them. I must express a deliberate opinion, founded on the experience of some years in important towns, that the provision of Act VI. 1864 (The Whipping Act) ought to be extended to offences against conservancy rules in such towns and cantonments as the Local Government may determine.

27. The class you have to deal with is the lowest in intelligence and the social scale. Their pay is not more than sufficient for their maintenance, and at Simla, where they can readily find other employment, it is not possible to replace them if they run away, which they always do if mulcted in a small fine.

28. Again, fine is neither atonement nor deterrent punishment for the offences, I will not detail, which these people daily commit against the public health, and until a Magistrate can punish with whipping, which I hope need seldom really be resorted to, flagrant breaches of conservancy rules, neither Simla nor any place in India is protected from the foulest pollution at the hands of the very people who are paid to preserve it from defilement.

29. The dry rubbish and bazár sweepings are carted out of Simla and burnt.

30. As much stable litter as possible is carried to the gardens at Annandale and utilized there.

31. The proposals of the Special Committee of 1877 for the disposal of night soil in Simla were three-fold—

1*st*.—The removal of as much as possible by carts to Budai Ghát, where a large quantity of land has been taken on lease by the Municipal Committee.

2*nd*.—The trench system for Chota Simla and the neighbourhood.

3*rd*.—For Elysium and that neighbourhood the continuance of the old system of burying in pits.

32. The cart system was organized, and 20 carts were in daily work, carrying 120 maunds of the collections of the houses between Boileau-ganj and the bazár to Budhai Ghát, five miles out of Simla. At first the old pit system was tried here; but, as everywhere else in or near Simla, owing to the rocky nature of the soil, affording no absorbent earth to deodorize the fœcal matter, the pits had to be abandoned, and the stuff is now, with the assistance of abundant water for flushing, thrown in a diluted state over the Committee's land some way down the khad, where it becomes with the action of the sun, air and rain, quickly dissipated, and causes no offence.

33. The cart system is very well as far as it goes, but it is exceedingly difficult in practice, and it would not be possible to introduce it on a more extended scale. In the first place the wear and tear is great, and the cost of bullocks, men, carts and harness excessive. No one will take the work on contract, and the repugnance of all but the lowest caste of natives to drive the bullocks or touch the carts, or have anything to say to the working of the thing at all, makes the arrangements most troublesome and absolutely prohibitory on a larger scale.

34. The trench system at Chota Simla on cultivated land leased by the Municipal Committee works well.

35. The pit system for Elysium and the back of Jakko has always been very unsatisfactory. As before mentioned, the burial of excreta in pits is simply storing it up; the soil cannot absorb it, and there are pits now filled several years ago where the stuff is just as liquid as the day it was put in. The pits were used as little as possible last year, and in the present I hope to arrange for trenching in cultivated ground at the back of Jakko also.

36. In the main bazár and the centre of Simla I have already mentioned what an unexpected amount of labor was thrown on the conservancy establishment from the readiness with which the people availed themselves of the new arrangements for their convenience. Some method had at once to be found for removing rapidly, completely and continuously, a large amount of latrine refuse. The quantity was too great to be carried away in carts, and the only plan that presented itself was that referred to in para. 7 of Government of India's letter No. 206 dated 24th October 1878, and deemed possibly objectionable.

37. I do not desire to defend in principle the voidance of human ordure into a water-course, but I am quite sure if there was ever an instance in which it was as little objectionable as possible, it is the present, and there is much sentiment in the objection now taken.

38. Two tanks were put on the side of this stream : the upper one was kept full of water, which was let on to and flushed out the other in which the latrine refuse was deposited, and the rush of water assisted by that always in the ravine carried the stuff immediately away, and there was no smell or offence of any kind.

39. No people drink from this stream for several miles down, and no source of water-supply is hereby polluted ; there are few, if any, habitations near, and the water is not drawn for any domestic purpose. This ravine and stream for the last 40 years, ever since the bazár of Simla was built on the hillside above, have been defiled beyond redemption, and nothing additional that now enters the stream can increase the pollution it has so long been subject to. This nallah has formed for years what may be called the main sewer of Simla, and if it was cleaned to-morrow, and not another particle of fœculent or decaying sewage matter ever entered it again, I do not believe its reputation would be redeemed.

40. The Special Committee which reported on Simla in 1875, as before referred to, proposed that this should be the outlet for the whole sewage of the place, and I confess that the natural advantages of making it so are great and very apparent. After the most anxious consideration of the subject, I see no other possible way of disposing of the sewage of Simla, unless it be taking up land and using the matter for cultivation, which would be far more expensive, and probably a less successful measure.

41. Something must inevitably give way to the unusual conditions of a place like Simla, and the extreme exigency of the situation, and if the exclusion of filth from the stream in question means, as stated in the Government of India's letter, merely the abandonment of a pretty walk on one of the many favorite picnic grounds near Simla, which the Water Falls has hitherto been, then I submit that, in the face of a great difficulty that has to be met, such sacrifice is too insignificant to be worth consideration in securing the best, if not the only, outfall channel for the sewage of the town.

42. Several officers of public health inspected the arrangements under which the liquid filth was carried down the stream, and pronounced them unobjectionable, and of the several contrivances for disposing of sewage and latrine refuse at work at Simla, I believe this last will be found the quickest and the least offensive way of any.

43. The labor of carrying the latrine collections to the bottom of a ravine, 2000 feet below the bazár, was very great and would be quite unnecessary if the proposal made last year to establish a depôt in a specially constructed house on the cart-road was carried out. From this depot an iron pipe should be led down the hillside into the ravine, and the matter flushed down it with an ample supply of water which is readily available.

44. The pipe cisterns and all apparatus are on the spot, and can come into use again when any complete project of conservancy and drainage for Simla is agreed upon.

45. The great principle laid down by sanitarians in Europe has been that as little as possible must be left to the will of the individual in any system for the removal of night soil sewage. The lower classes in large towns, and how much less the only class on which we are dependent in India, are not to be trusted in this important matter. The disposal, therefore, of the sewage matter of Simla by gravitation down the hillside and the involuntary mechanical agency of water through a pipe falling into a stream useless for any other purpose than that of an outfall sewer, appears the best way of insuring the speedy removal from our habitations of this offensive matter independent of the will of the individual, which is the great end to be obtained in any safe system of town conservancy.

46. With reference to para 8 of the Government letter, which the Municipal Committee have had before them, I am desired to say they will be very glad to see a complete project for conservancy carried out in the town of Simla at an expenditure of two lakhs of rupees, or as may be determined by Government, although several Engineer Officers who have carefully considered the matter have doubted whether a sum even less than that could be well laid out in such a conservancy project as is necessary for Simla.

47. With regard to a project itself which the Committee are urged to take into consideration, they feel that this is a matter in which no time has yet been lost.

48. The construction of good latrines and the work lately carried out is all in assistance on a complete scheme, and until the new water-supply which has only just been begun is more advanced, probably no system of drainage for Simla can be absolutely determined on.

49. In 1875 a complete project of drainage and conservancy for Simla with plans was submitted for the consideration and sanction of the Government of India. The Municipal Committee have never been informed in what respect this project was defective, or why it should not suffice. The project was favorably recommended by officers of great experience still in the service and confidence of Government. The Committee therefore trust that without more delay, and before further expense is incurred in any fresh project, the Government of India and the Local Government may be pleased to examine that proposal, and determine whether it is appropriate or not.

50. Any scheme of drainage and conservancy, whether as a project or in execution, must be entrusted to an Hydraulic Engineer of special qualifications and experience, and not to any officer of the Department of Public Works who may be without an appointment or at leisure to take up the work. The conditions are very unusual, and though the number of feasible schemes is probably limited, the Committee consider the very best opinion to be had in the Department should be taken upon it.

51. In para. 9 of the Government letter reference is made to the burning of latrine refuse and garbage in properly constructed offal kilns. Experiments of the kind were made some years ago in Simla, and entirely failed, both from the great expenditure and cost of fuel, and because that for at least 8 months out of 12 the substances to be consumed were from their nature and the local conditions of soil and climate so green and wet that the fires in the kilns could not be kept alight, or so alive as to afford with an unlimited expenditure of fuel sufficient consuming power, and the consequence was the substances were never consumed at all.

52. I have sought all the information I possibly can on the subject of dessicating machines but I find their success anywhere has been more than doubtful. In Bombay, where a large machine was erected regardless of expense on the latest principles, it soon had to be closed, as the odours from the gases generated were quite intolerable. What would be the condition of Simla with half a dozen offal kilns burning day and night in several directions? As it is, the attempt to burn stable litter raises an immediate outcry for its suppression, neither is there any prevailing wind in these hills that shall determine the quarter in which to place the kilns with any hope of keeping the atmosphere in some part of the town free from taint.

53. The last Special Committee on Simla improvements considered the project of burning, and Major Steel, R. E., took up the question with great interest. He promised to make the matter one of special enquiry in Calcutta, and, during a cold weather tour, in India, both as to the construction of ovens or kilns and the reasonable prospects of success. This officer, with whom I remained in correspondence on the subject, finally declared that burning on the scale necessary was not possible in Simla.

Bazar Improvements and Demolitions.

54. Since October last the demolition of houses on the ridge or north side of the main bazár has made good progress, and altogether now—— houses have been removed. The demolition of the remaining houses will, I hope, be completed next cold weather, if funds are available to pay compensation from the ordinary income of the municipality.

55. The improvement to the health and appearance of Simla by the removal of a mass of poor tenements, crowded one on the other in the main street of the station, will be generally admitted.

56. No resort has been had to the Land Acquisition Act either in removing houses in the bazár or in taking up land from private estates for road extension. The task of settling with proprietors has not been an easy one, but the advantage of a voluntary arrangement over forcible ejectments is not slight, and property has certainly been acquired more cheaply than it would have been under the Act.

57. On the south side of the bazár a valuable improvement has been made by the removal of 30 houses in the main street immediately below the church. These houses were piled tier upon tier from the lower bazár and formed the most unwholesome rookery in Simla. This alteration gives what is urged as important in the concluding para. of the Government of India's letter,

namely, the opening up of channels of thorough communication on the lower side of the bazár, though the necessity of these air-shafts, which were intended to afford ventilation to the houses on the upper side, will, with the entire removal of those houses shortly, no longer exist.

58. The lower side of the bazár has now been cut up into six or rather eight blocks, as arrangements have been made for making two more openings by removing houses.

This ought to assist any drainage scheme, as in re-building the shops on the lower side, and substituting for the previous poor tenements a really good native house with a neat front, care has been taken also to leave as far as possible a passage behind.

59. The personal influence which has induced the owners to put up these improved dwellings at their own cost has borne fruit in the enormously increased rents which they at once obtain for them.

60. The re-construction of the lower bazár has also been attended to, and a large number of new shops of good design have been built here.

61. The difficulty of compensation and location elsewhere of evicted persons has not been small. Every one wishes to take the compensation in cash, and part payment in the shape of a new building site elsewhere found no favor. The completion in the last few months of the fine grain-market affording large accommodation and the new dwellings and shops on the market site have alone enabled the improvement of the native town to be carried out. More sites are required for native houses, which I hope to arrange shortly; in the meantime it has been up till this time possible to provide to the satisfaction of the persons concerned, and without overcrowding.

THE ROADS.

62. The amount of work done on the roads in Simla during the past cold weather has been very large, and though the improvement on the road from Boileau-ganj going round Jakko is very apparent, few probably will appreciate the exertion it has cost the Municipal Engineer and others engaged in the work.

63. To widen out and level a main road in the hills running through private estates for the greater part of its length is a far more difficult task than to construct a new road on a line at choice or through public land.

64. The gradient and width of the road from Sackville to the Church now leaves little to be desired; hills have been levelled down into hollows and the breadth widened from 24 feet to 25, principally by building out massive retaining walls at the sides, and the whole has been substantially railed in.

65. From the Church to the first mile-post the hill has been much cut down and the road widened.

66. From the first mile-post to the Convent an entirely new level road has been made, and should be ready by the 1st of May. The work in cutting through the cliffs proved much heavier even than was expected.

67. The new road ceases at the Convent but the old road as far as the Chota Simla bazár, has been greatly improved in width and the whole substantially fenced.

68. I may observe that the work on the roads has been carried out in accordance with the project submitted by the Committee that reported in 1877. The expenditure which is considerably less than was at first contemplated has been largely supplemented from the ordinary funds of the municipality.

69. The widening of the roads will do much for the salubrity and health of Simla, in giving lungs to the place which the rapidly increasing density of population and the hitherto insufficient width of the main thoroughfare made very necessary indeed.

Copy of a Memo No. 2006, dated 28th April 1879 from the Secretary to Government, Punjab, Public Works Dept, to the Deputy Commissioner and President Municipal Committee Simla:—

Acknowledges receipt of Deputy Commissioner's report on progress of works at Simla with his No. 195, dated 4th April 1879.

2. As regards the remarks in para. 5 of the report, observes that the pipes vary in size and the feasibility of bringing water to Sangowli by November next depends on whether the 7" main is received early enough. All care will be taken to reduce as much as possible the inconvenience to the public that will be caused by works being carried on within municipal limits during the summer.

3. Referring to paras. 6 and 19 of the report, the attention of the Executive Engineer will be drawn to the necessity brought to notice for keeping the ordinary and existing sources of water-supply in proper order, these sources have been too much neglected.

4. The proposal in para. 17 of the report for protection of the spring of water at the back of Jakko near "Barnes Court" is agreed to.

5. The suggestion in para. 26 that the provisions of Act VI of 1864, should be extended to offences against conservancy rules will be referred to the Civil Department for opinion.

6. Referring to para. 49 of the report, the project for drainage and conservancy therein alluded to does not appear to have passed through this office, enquiry will be made of the Government of India as to what action has been taken in the matter. The observation in para. 50 that such a scheme should only be entrusted to a Hydraulic Engineer of special qualifications and experience for the work is concurred in.

7 Adverting to para. 53 of the report, the only place Chief Engineer knows of where the system of burning latrine and other refuse has been fully carried out is Kurrachi.

LUDHIANA.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Ludhiána	40,385	75,182	12,422	17
Raikot	8,262	2,714	716	26
Jagraon	16,321	14,347	2,107	15
Khanna	3,660	5,493	1,205	22
Machiwára	6,224	3,921	864	22
Bilolpur	3,059	1,315	410	31

The following sanitary measures were carried out during the year:—

1. Wooden latrine screens capable of being shifted are under construction on the pattern of those used by the military authorities.
2. The town refuse is now sold, and brings in about Rs. 100 monthly.
3. Refuse is not permitted to be thrown into the drains as was formerly the case.
4. The tank in the centre of the town, a receptacle of all kinds of filth, has been emptied.

5. The burning Ghats have been enclosed, and the ashes forbidden to be thrown into the Budha nala.

6. The water of the wells is being analysed by degrees with a view, if possible, of providing wholesome drinking water.

JULLUNDUR.

Municipalities.	Population according to census of 1876.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Jullundur	50,924	35,423	12,577	35
Adampur	4,153	1,238	224	18
Aláwalpur	4,836	2,409	210	9
Kartárpur	11,053	6,475	1,132	17
Bunga	4,817	2,762	390	14
Rahon	12,914	6,169	1,077	17
Nawashahr	5,351	1,837	451	24
Phillour	6,251	4,668	613	13
Núrmahal	9,025	5,435	624	11
Nakodar	9,780	5,559	838	15
Mahatpur	6,853	1,084	121	11

Near the town of Jullundur itself Rs. 1,500 were expended on the raising of the Tánda road, and Rs. 600 in the construction of a drain near Kabulpur. These two works were part of a general scheme to protect the city from the action of floods. The floods of the last autumn however were too much for them. Both were breached, but have since been repaired.

On this subject I annex herewith extract para. 10 of No. 1830, dated 16th April, from Secretary to Government, Punjab, to my address.

Para 10. With reference to the inundations which have resulted in so much damage and mortality in the city of Jullundur, the question has been specially reported on by Major Forbes, R. E. An increase in the waterway through the Railway bank is being made, and similar flood openings will be made in the road. The raising of the Tánda road and repairs to Sheikhpur bund protecting the north of the city has been completed, and it would also appear from the report of Superintending Engineer that a drainage channel to clear away any accumulation around the city has been carried out. The completion of these walls will, it is hoped, prevent the recurrence of these inundations. Yet until the hollows about the city are drained or filled up, the sanitary conditions of the city would seem to be very imperfect.

At Kartarpur Rs. 372 were spent in the completion of external drainage works.

At all the towns of the district latrines were kept in order and repaired so far as funds allowed.

HOSHIARPUR.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Hoshiárpur	21,316	41,488	9,734	23
Haráua	7,802	4,317	1,644	38
Garhdiwála	3,874	3,734	1,418	38
Dasuya	8,675	1,919	512	27
Urmur and Tánda	13,971	3,976	1,236	31
Miáni	7,993	1,403	384	27
Mukerian	5,125	2,093	495	23
Una	4,908	1,307	286	22
Nandpur	6,405	2,143	358	17

The directions summing up my recommendations were thrown into the form of a proclamation by Mr. P. Johnstone, Assistant Commissioner, and Secretary to the District Committee, and translated into the Vernacular. Of these 3,000 copies were lithogaphed, 2,000 in the Persian and 1,000 in the Hindi characters, and distributed throughout the district and posted at the village *chaupál* or *diwán-khána*. A large number of them was also directed to the headmen of villages and of rural circles (Zaildárs) who have been encouraged especially to pay attention to these important concerns.

There are masonry latrines separate for men and women, placed at convenient distances towards the north, where the great "*cho*" (hill torrent) runs, the latrines are of bamboo matting as they are liable to be swept away whenever the torrent is in flood. There is a special establishment of sweepers maintained for the service of the latrines, and the dry earth system is in force.

The soil is removed in iron drums, and the Committee has recently purchased for Rs. 150 one of Crowley's one-bullock conservancy cart for the same purpose. It is then buried in two places. Half is buried to the east of the town to be sold as manure, when after a year, it is thoroughly disinfected, the other half is being buried near the municipal slaughter house, and it is hoped shortly to lay out a grove or garden on what is now a sandy waste.

An experiment has been tried in the way of crushing bones and decomposing them with sulphuric acid and otherwise to form manure. This source of supply of valuable fertilizing agent is too much neglected in India.

The main drain continues to work well, and its discharge is now on to a piece of waste land in the "cho" above mentioned, where it is hoped that the land may be redeemed and trees reared. This is the more important as such a grove would form a bulwark to land lying to the west of the town which is now threatened by a re-entering angle of the "cho."

The chief sanitary improvement was the progress made in filling up the pond known as Kacha Kila Toba, half of which was completed during the year. The Committee had some difficulty in making a satisfactory arrangement with the owners, a numerous and obstinate body, but eventually succeeded. This pond was formerly a common receptacle for the drainage of the adjacent dwellings, and a formidable propagator of epidemic sickness. When it shall have been consolidated that part which is next the town ($\frac{2}{6}$) will be at the disposal of the co-owners and the rest at that of the Committee. The Committee has arranged to cut a drain to join the main drain to carry off the sewage which formerly flowed or was thrown into the pond.

The other great sanitary improvement has been the raising of the floor of the large masonry tank adjoining the district school and the dispensary known as Pollo Mull's, and the arranging for a periodical renewal of the water, that which is drained off being useful to the neighbouring fields.

For the coming year, the Committee has it in contemplation to construct, as mentioned above, a drain from the site of the Kacha Kila Toba to fall into the main drain near the Police Station to carry off the sewage which formerly was received by the pond.

In Garhdiwála a drain was constructed at a cost of Rs. 111, pavement was constructed and repaired at a cost of Rs. 847-6. In Hariána pavements were repaired at a cost of Rs. 334-4-6; a small sum was spent on pavement at Anandpur and at Una, a well was cleaned at Dasuya.

The Committee continues its efforts to get a monoply of the sweepings of the houses so as to have in its own hands the whole manure supply of the town. Its success has hitherto been very small. The houses are served by sweepers whose service is a heritage, and who are most tenacious of their prescriptive right to the sweepings they collect.

KANGRA.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Dharmsála	2,862	7,161	2,191	30
Kángra	6,336	5,407	1,319	24
Tira Sujanpur	3,393	2,848	457	16
Haripur	3,842	2,393	338	14
Jawálamukhi	2,844	2,136	234	11
Nùrpur	7,337	4,468	631	14

With the exception of a canal at Dharmsála no special water-supply exists in the district. This canal is supplied from the snow streams, and use of water is subject to a tax per house. The general condition of the sources of the water-supply in the district is good, and wells, báolis &c., are properly attended to.

Being a hill district there are no sewerage drains kept in Kángra and Nurpur.

A new latrine was built at Dharmsála.

AMRITSAR.

Municipalities.	Population according to census of 1876.	Income in 1878-79 including balance of past year.	Expended on sanitary works in 1878-79.	Percentage of expenditure on sanitary works to income.
Amritsar	142,381	533,987	75,534	14
Majitha	6,004	1,495	388	26
Jandiála	7,037	8,447	1,534	18
Rámdas	5,257	3,043	144	5
Tarn Táran Khas	31,33	6,408	1,047	16
Varowal	5,958	3,066	581	19

Water-supply and sewerage.

A full report on the water-supply and sewerag arrangements will be found in my inspection report of this city (vide Section X.)

No particulars are given by the Deputy Commissioner regarding the sanitary improvements in the municipal towns of this district, but from the statement of municipal income and expenditure it would appear that a considerable sum has been spent for sanitary purposes.

GURDASPUR.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Gurdáspur	4,137	3,727	1,052	28
Dinanagar	6,626	7,989	1,147	14
Bahrámpur	3,477	1,386	236	17
Kalánaur	6,051	2,187	510	23
Pathánkot	4,507	3,590	282	8
Sujánpur	6,557	2,584	288	11
Narot	3,944	1,613	231	14
Shahpur	1,336	1,976	202	10
Sukhuchak	3,246	1,251	120	9
Darman	1,607	449	63	14
Kot Naina	1,726	816	96	12
Batala	2,6929	18,070	3,276	18
Srigovindpur	5,531	3,238	467	14
Fatahgarh	4,481	1,980	215	11
Dera Nanak	7,212	3,861	679	17

All repairs are regularly done as far as funds can permit to all sources of water-supply, such as wells , springs, and tanks.

A sufficient establishment is maintained for sweeping streets and drains and washing the latter and removing filth outside each town. There are public latrines at Gurdáspur and Batála, where the dry earth system as far as possible is in force. The conservancy arrangements are under the supervision of the members of the Municipal Committees who are responsible for the sanitation of the towns.

At Gurdáspur pavements, roads and bridges, and drains were repaired ; at Dinanagar certain streets were paved and drains constructed. Kalánaur, bridges and drains repaired. Batála, streets paved and repaired, roads and bridges repaired, a drain in Bhundàri mohalla constructed, also one at Mori gate, and wells repaired. Dera Nanak, streets paved in mohalla Bhoop Chand, drain constructed opposite city police. Fatahgarh, streets paved. Shahpur, wells repaired.

SIALKOT.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Siálkot	32,989	25,546	5,471	21
Daska	5,401	595	18	3
Jamki	4,359	1,375	108	8
Mitránwali	3,095	1,183	24	2
Kila Sobha Singh	5,159	2,065	216	10
Pasrûr	8,276	3,109	288	9
Zafarwàl	4,975	2,454	323	13
Sankhatra	2,390	1,037	30	3
Nàrowál	5,297	2,449	542	22

In the town of Siálkot Rs. 804 were spent in improving the pavements of various mohallas and filling up holes; Rs. 192 in repairing bridges and culverts ; Rs. 758 in clearing out and constructing two drains on the north side of the city where the drainage water of that part of the town used to lodge and stagnate, and Rs. 66 were expended in repairing wells. In Siálkot as well as in all the other municipelities greater attention was paid towards the cleanliness of the towns, and conservancy arrangements were better supervised by the members of the committee than before.

LAHORE.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Lahore	128,441	208,567	62,794	30
Sharakpur	4,425	2,988	384	13
Chunian	6,469	6,508	1,689	26
Khudián	3,322	1,785	156	9
Kasur	16,793	21,362	4,359	20
Khem Karn	5,860	3,432	760	22
Patti	6,290	5,428	794	15

At Lahore 13 roads have been entirely remetalled, and all the other metalled roads have been put in order. The city paving is now being proceeded with, and the city drains in one or two places have been put into better working order. The outfall sewer is in the hands of the Public Works Department. The construction of this most important sewer has been made over to a contractor under the supervision of Mr. Clark, the Executive Engineer. The contractor has most needlessly delayed the work, and the sewer, which should have been finished in May, has not yet advanced more than 900 yards from its starting point. The following are the more important works executed by the Lahore Municipality within municipal limits :—

1*st*. Open saucer drain and culvert from Mall to Temple road.

2*nd*. Paving Joura Mori's street in city.

3*rd*. Wooden covers to city drains.

4*th*. Various repairs to city drains.

5*th*. Various repairs to latrines.

6*th*. Thorough repair and paving of Kine Slaughter house.

7*th*. Drain and approach near Bank of Bengal repaired.

8*th*. Defects in drainage of Abkári remedied.

9*th*. Trees planted in Sadr bazár.

10*th*. Street lamps erected in city and station roads.

The municipality of Kasur has, under the superintendence of Kadir Baksh Khan, Extra Assistant Commissioner, done good work ; 3 roads were metalled at a cost of Rs. 831, a well constructed at Rs. 353 two bridges at Rs. 137, and a neat wall round Committee house, Rs. 580. Repairs to roads and drains cost Rs. 251.

Chunian.

The Municipality of Chunian has worked with considerable energy, and the citizens of this town have shown a most commendable spirit as evidenced by their paying out of their own pockets for work which will be a credit to the place. The Tahsildar, Muhammad Ashraf, has done good work in this town. Two new gates were constructed at a cost of Rs. 248, a drain outside Kane Shahwala gate, Rs. 155, metalling of a road Rs. 207, paving of two lanes, Rs. 205, repairs to wells, tanks &c, Rs. 366. In addition the municipal members and other citizens have more than half completed, at their own expense, a handsome range of new shops in the new mandi. These are most artistically constructed, and the plan when finished will be a great ornament and convenience to the town. These shops are all of one size, are very spacious, and the external decorations in all of pointed bricks are exactly similar. Two lambardárs of Harchoke, Jawaher Singh and Jaswand Singh have, at their own expense (some 500 rupees), erected a new gateway to the town. This

is well built of pointed bricks and is not defaced by plaster. The citizens have subscribed to erect a Musáfar Khana (Traveller's House) in the town as well as one outside. The public spirit of the Chunian people is much to be commended.

Khem Karn. The municipality of Khem Karn does not show good results. Their income is about the same as is that of Patti ; but their money appears to have been much less usefully expended than has been that of Chunian. Rs. 192 were spent in paving two lanes, and Rs. 57 for repairing wooden planks over drains.

Patti. This municipality has on the whole done well ; some of its members are alive to the need there is for proper sanitation and cleanliness. A gate was constructed here at Rs. 337, and two new bridges at Rs. 318, and Rs. 41 spent for repairs to latrines.

Sharakpur and Khudián. Are small places, and the income of these which is very small, seems to have been on the whole well expended.

GUJRANWALA.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Gujránwála	20,362	21,836	4,341	20
Eminabad	6,719	2,796	407	14
Kila Didar Singh	2,214	2,027	630	31
Wazirabad	15,346	19,725	5,201	26
Sohdra	4,716	2,295	544	24
Akálgarh	5,037	3,445	449	13
Rámnagar	7,180	6,007	1,607	27
Háfizabad	2,299	1,334	378	28
Jalalpur	2,572	2,929	804	27
Pindi Bhatián	4,188	2,667	838	31

Gujránwala.—Cost of repairs to one bridge, 5 drainage channels, one latrine, four pavements of streets, clearing 5 wells, Rs. 830. Wazirabad.—Cost of repairs to two drainage channels, 3 pavements, Rs. 219.

Early in the year changes were made in the conservancy arrangements of Gujránwála. A lease was given of all the town refuse (including latrine matter) to four contractors who were bound by stipulations in the lease to bury this refuse (in three out of four appointed localities) before utilizing it as manure, while in the fourth locality they were permitted to use it for the brick kilns.

FEROZEPORE.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of past year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Ferozepore	15,168	51,829	15,698	30
Zira	3,471	1,821	220	12
Fatahgarh	1,654	1,009	33	3
Makhu	1,713	2,076	66	3
Dharm Kot	5,467	2,380	187	8
Kot Isa Khan	1,520	697	66	9
Muktsar	2,983	1,518	258	17

Water-supply is from tanks and wells. In the towns and larger villages steps have been taken to clear out the latter and sufficiently protect their margins from pollution. Much has been done in this way in the city of Ferozepore by the Committee under the active superintendence of Mr. Bird, Judicial Assistant. Tanks are now used mostly for cattle, and grants for repairing and enlarging these have been freely made by the District Committee, and due care taken in most cases to keep them clean. The practice of steeping flax in them has been forbidden, and water set apart for this purpose in villages where the cultivation of flax is continued. In Muktsar much has been done, and done well to keep the drains of what will be, when the canal comes, a large town in good order. Latrines have also been made, but the Játs of the village communities cannot, except by a long course of training, be diverted from their old habits of accumulating all their manure outside the village wall whence it drains into the nearest tank. It is proposed, as was done in Siálkot, to have certain villages experimented on first, as suggested by the Sanitary Commissioner, that when the better state of health of these becomes manifest, the rest may offer less passive resistance to sanitary improvements.

Ferozepore.

In accordance with the suggestions of the Sanitary Commissioner 115 wells within the city were cleaned out, and 7 pakka latrines outside the walls were roofed over, and furnished with iron receptacles. The filth was at first trenched and then sold to contractors. The system of disposing of the filth of the city to contractors was found to be prejudicial to the cleaning of the streets, since it was seldom or never removed in time. At the expiration of the contract in March another plan was tried, which has worked well, and now any person may remove it by paying 8 annas per ass-load. The Police are unable, for want of men, to check nuisances committed at other places than the latrines constructed for the purpose, and lately two active men have been engaged by the municipality to apprehend offenders. The two city tanks were filled with canal water during the past year, and attention was paid to punish nuisances being committed near them, and to check the practice of washing clothes there. The Gobarmandi, which is very much resorted to by laden carts, was in a very filthy and neglected state. At last the owners made it over to the municipality, who have repaired the road leading to it, and filled up the depression, while the manure is farmed out for the sum of Rs. 100. The condition of the city is all that can be desired, several pakka drains were made to carry off refuse water in the side streets and lanes, and all depressions filled up where possible. Particular care was taken to prevent the blocking up of the public streets with grain, sugar-cane, sweetmeats &c. The shop-keepers were found to have a practice of using the side drains as receptacles for holding grain exposed for sale. They have now been instructed that this cannot be allowed, but that there is no very great objection to its being exposed for sale in front of the shops so long as planks are laid over the side drains to admit of their being cleaned out. Fines have been inflicted when these instructions have been neglected.

RAWALPINDI.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Rawalpindi	20,802	78,473	24,262	31
Pindigheb	8,223	3,332	586	17
Makhad	4,252	4,335	489	11
Hazro	7,950	10,685	1,676	16
Attock and Malali Tala	3,213	2,853	819	29

The municipality of Rawalpindi not being in a financial position to carry out any of the schemes for a water-supply which have been prepared, turned their attention to additional wells, and one sunk at the dispensary appears after analysis to supply fair water (vide extract. para 6 of No. 1830, dated 16th April 1879 from Secretary to Government Punjab Public Works Department to my address).

The people living near the rivers drink river water. Tanks and wells supply the remainder of the district. Wells are frequently cleaned, but the tank water is often impure and especially in a dry season. Nothing special in the way of new work done. An efficient staff of sweepers is employed, and drains are periodically flushed, repairs of latrines and drains have been made.

Dr. Henderson, the Civil Surgeon, makes the following suggestions for improving the sanitary conditions of villages :—

"Conservancy arrangements in the town and villages are pretty well looked after, but I think some stringent measures should be taken to cause the trench system to be adopted everywhere. No masonry or matting latrines are required, simply trenches dug at convenient distances from each village to be used only for one day, then to be filled in and another dug for next day's use. Every village is at present surrounded by a mass of human ordure which is no doubt the cause of much sickness. I am aware it is very difficult to change the habits of a large number of people in matters of this kind, but if it is wished to improve the sanitary condition of the villages, this strikes me as one of the first things to be insisted on."

JHELUM.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Jhelam	7,947	27,989	5,956	21
Chakwal	5,674	5,002	522	10
Talagang	5,659	3,186	569	18
Pind Dadan Khan	15,397	33,598	8,141	24

Sanitary works.

Particulars not given.

Nothing particular to note about the water-supply. In Pind Dadan Khan most of the wells are bad. The people for the most part draw water from large reservoirs in which good water brought by a canal from the river when in flood is stored. The canal is cleaned out every year.

The conservancy arrangements in the municipal towns are performed by their conservancy establishment. In Jhelum the town refuse is daily removed to a considerable distance from the town, and collected in a ditch on the Kala road, arrangements have been made for the sale of it for this year.

GUJRAT.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Gujrat	17,401	10,701	2,216	21
Jalalpur	14,014	7,313	1,998	27
Kunjah	5,355	2,042	498	24
Dinga	5,086	1,786	449	25

Sanitary works. Details not given.

The wells in the four large towns, *viz*, Gujrat, Jalalpur, Dinga and Kotla have been cleaned out as usual, and attention has been continually paid to cleansing of the drains. For further information see my summarized Inspection Report (Section X.)

SHAHPUR.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Shahpur	4,743	2,229	272	12
Sahiwál	8,634	7,778	2,160	28
Ghirot	2,799	3,682	842	23
Bhera	14,710	10,587	1,349	13
Miáni	6,158	3,627	851	23
Khushab	8,344	23,562	4,218	18

Water channel has been cut to bring water from the Corbynwala to convey it through the town of Khushab by which it can be thoroughly washed out and refuse carried into the water. A pakka tank has been constructed at Ghirot for the storage of rain water. In Bhera a street has been paved, and number of hollows and depressions filled in. In all the towns, the streets, drains, latrines, tanks &c., have been repaired and improved.

MOOLTAN.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Mooltan	50,878	1,19,206	22,570	19
Shujabad	6,280	14,138	1,691	12
Jalálpur	3,525	11,302	319	3
Karor	4,650	3,033	735	24
Dunyapur	2,054	2,557	462	18
Talamba	1,948	1,004	217	21

All the wells in the Mooltan and Shujabad municipalities, from which water is taken for drinking purposes, were cleaned at a cost of Rs. 502, and an old well in the Dunyapur municipality was re-dug, and repaired at a cost of Rs. 306. The drains in Mooltan are cleaned out every second day; a sweeper with the aid of a Bhisti clears each drain. There are 3 places or pits about ½ mile from the city where the filth is thrown, the latrines are cleaned early in the morning when the bullock men collect the filth and carry it to the pits by 9 o'clock, when it is buried and permitted to deodorize for 4 or 5 months. When it is found by the Civil Surgeon after that period to be fit to be used as manure, it is sold.

JHANG.

Municipalities.	Population according to census of 1875.	Income in 1878 including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Jhang and Maghiána	22,227	25,126	9,209	36
Chiniot	11,999	6,953	821	12
Shorkot	2,478	1,954	144	7
Ahamdpur	2,146	928	72	8

Four streets in Maghiána and two in Jhang have been paved, and the large pakka tank near the Committee house which was in an unfinished state has been completed. The pakka drains out of order in the Maghiána and Jhang towns have been repaired, the number of sweepers employed to keep the town of Maghiana clean has been increased from 20 to 23, and on the whole the town is kept tolerably clean.

Town sweepings are removed morning and evening on donkeys, and deposited in trenches at some distance from towns. Latrine refuse is similarly disposed of. The towns are fairly well drained, the pakka drains are generally washed out once a day. Water-supply is from wells, abundant and quality good. The wells are protected from contamination as much as possible.

MONTGOMERY

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Montgomery	2,588	1,963	639	32
Kamália	5,900	2,926	593	20
Pákpattan	5,723	5,384	1,258	23
Sayadwála	3,437	1,857	217	12
Dipálpur	3,407	1,416	301	21

In the Dipálpur tahsíl, 6 wells within the municipal jurisdiction were cleaned out. It is believed that some of the wells in other tahsíls were also cleaned out privately by the owners. In Sayadwala 4 new latrines were constructed.

The Civil Surgeon makes the following remarks in his report :—" The main drainage channel (at Montgomery) has not been cleaned out for years. The city drains too are very badly kept. I may say in fact that all through the district sanitation is disgracefully neglected. The latrines, especially those of the Sadr stations, are a disgrace. It would be much kinder and more considerate if the people were allowed to sit broad cast all over the town plain rather than expect them to use places so saturated with fœcal matter as almost to defy one to approach them."

MUZAFFARGARH.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage os expenditure on sanitary works to income.
Muzaffargarh	2,537	4,383	1,342	31
Khangarh	2,802	5,693	1,060	19
Alipur	2,282	4,783	1,783	37
Khairpur	2,562	3,652	484	13
Sitpur	1,753	2,169	316	14
Jatoi	4,814	1,608	106	6
Shahr Sultan	2,836	1,799	150	8

The supply of water for the towns is good and abundant; wells are numerous throughout the district, and those in the towns and larger villages have masonry linings. A certain number in the larger towns are set apart for drinking purposes, and are protected by raised masonry platforms, and the water in them is lifted by Persian wheel; no defilement about these protected wells is allowed. The water-level varies with the season, and the proximity of the rivers Chenab and Indus, from four to twenty feet from the surface of the ground. During the flood season, when the canals are full of water, the people use the water in them in preference to that from wells if it be as conveniently to hand. The drainage of the towns of Khangarh, Alipur, and Muzaffargarh is fair; improvements have been made on this point in each of these places during the year, and the area of brick pavements has also been increased in each. In Muzaffargarh and Alipur some of the narrow bye-lanes have been and are now being bricked, the plan being to have no drains on each side of the roadway, but giving it a slightly concave shape, the water will drain off, and the roadway can easily be kept clean by the town sweepers. The drainage is carried into hollows, excavations and fields outside each town. Refuse is carried out of the town on asses, and is deposited in cultivated fields, when it is ploughed into the ground. The cultivators eagerly seek and pay for it.

DERA ISMAIL KHAN.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Dera Ismail Khan	19,954	47,888	12,085	25
Kulachi	7,856	9,404	2,520	27
Bhakkar	4,799	4,086	898	22
Leiah	5,689	7,632	3,006	39
Tánk	3,186	3,618	756	21
Karor	2,766	2,214	1,384	62

The conservancy arrangements of the town of Dera Ismail Khan are as follows:—The night soil from private houses is removed every morning on carts to a distance from the town where it is buried in trenches prepared for the purpose, and after six months it is sold for manuring purposes.

DERA GHAZI KHAN.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Dera Gházi Khan	19,133	28,925	10,864	37
Jámpur	4,209	6,399	694	11
Dájal	5,016	8,083	1,258	15
Rajanpur	3,548	4,685	1,168	25
Mithankot	3,347	2,804	270	10

Measures taken for sanitary improvements consisted of construction of new drains and repairs and cleanliness of old ones, also the general cleanliness of the city.

BANNU.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Edwardes-abad	3,896	16,026	4,981	31
Lakki	4,406	3,094	544	17
Isa Khel	6,541	4,540	1,636	36
Kálabágh	6,082	12,004	1,060	9

Nothing particular to note.

PESHAWAR.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Per centage of expenditure on sanitary works to income.
Peshawar	58,430	131,265	28,006	21
Shankargarh	1,017	2,032	390	19

All works connected with bringing water from the Bára river into the cantonment of Peshawar are completed. Also the filter beds, and the service reservoir (containing one day's supply) is in a very advanced state, and will be ready in the course of a couple of months. An indent for the pipes requisite for the distribution of the water throughout cantonments has been sent to the Secretary of State, and on the assumption that such are received within the next three or four months, the official year of 1879-80 should see this work completed as far as sanctioned (*vide* copy of letter No. 279, dated 4th February 1879, from Superintending Engineer, Rawalpindi Command, Military Works, to Secretary to Government, Punjab, Public Works Department).

The Deputy Commissioner states as follows regarding the conservancy and sewerage arrangements of the city of Peshawar:—"Since I made my last report I am glad to say the town funds are not now so crippled as they were; as a result we are enabled to go on with improvements in the state of roads, bridges, tanks and wells, &c. Large drains have not been made, but wherever absolutely necessary, surface drains have been made, and care has been taken to keep existing ones in repairs."

The following are the new works of any importance :—metalling road from Dabgarri Gate to Mákeson Mandi, from thence to Kissa Khan, from thence to Gorukhatri, and from the Bajouri Gate to Mackeson Mandi.

Construction of a slaughter-yard for horned cattle and of another for sheep and goats.

Enclosing of ground for night soil.

Construction of a bridge some yards from the Kacherry Gate, and of one outside the Kohat Gate.

HAZARA.

Municipalities.	Population according to census of 1875	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Abbott-abad	1,194	3,530	953	27
Nawashahr	3,445	2,042	685	33
Baffa	4,494	1,325	70	5
Haripur	4,477	7,106	1,440	20

Nothing particular to note.

KOHAT.

Municipalities.	Population according to census of 1875.	Income in 1878, including balance of previous year.	Expended on sanitary works in 1878.	Percentage of expenditure on sanitary works to income.
Kohat	11,043	21,322	6,474	30

A complete scheme for cleaning the city is under preparation. Plans are being made and levels taken, so that every thing may be done on one uniform system. The sum of Rs. 3,000 has been budgetted for to carry out a portion of this scheme during the years 1879-80.

SECTION X.—GENERAL REMARKS AND PERSONAL PROCEEDINGS.

Summary of proceedings.

65. I held the appointment of Sanitary Commissioner, Punjab (in which I was made permanent in November 1877), for 11 months of the year under report. From 1st September to 1st October 1878, I was engaged on special duty under the orders of the Foreign Department. During my absence the late Dr. S. C. Courtney, Civil Surgeon of Peshâwar, was appointed to officiate for me. In this section of my report for 1877, I gave the results of a tour of inspection round the eastern half of the Province, and it was my intention to have made a similar tour during the past cold season over the western half of the Province. I was unable, however, to move into camp for this purpose owing to the want of carriage, all available cattle having been taken up for the army at that time moving to the Afghan frontier. My inspection work was consequently confined to the towns on the several lines of railway. A list of those inspected is given in the margin. My report upon each was submitted to Government at the time the inspection was made. A summary of these reports is added to this section. On my return to head-quarters from Rewâri, I was directed by the local Government to proceed to Rawalpindi to form a Committee for the inspection of villages within a radius of 5 miles of that military cantonment in accordance with the orders of the Government of India, Home Department, No. 6—220 of 3rd November 1877. A copy of the report of this Committee is given as an appendix, as also copies of an inspection report on Rupar Jail and Lawrence Military Asylum.

1. Simla Sanitarium.
2. Jullundur.
3. Ludhiâna.
4. Amritsar.
5. Gujrat.
6. Jhelum.
7. Wazirabad.
8. Mooltan.
9. Muzaffargarh.
10. Montgomery.
11. Delhi.
12. Gurgaon.
13. Rewâri.
14. Rawalpindi.

Address on sanitary matters to native members of Municipal Committees at most of the several towns inspected.

66. At most of the several towns inspected I met the native members of the Municipal Committees, and addressed them on the subject of the sanitary condition of their towns, and drew their attention to such points as seemed to call for particular notice, especially with reference to the common causes of impurity affecting the air and the water, their several populations were dependent upon, and pointing out to them the necessity of a pure breathing air and wholesome water-supply, as two of the most important requisites for the maintenance of sound health; dwelt upon the duty which devolved upon them in their position as members of the Municipal Committee to devote their earnest attention to the measures practicable for the remedy of the evils which now beset their towns as the result either of an entire neglect of ordinary precautions or the faulty and inefficient nature of the measures adopted in this direction. I gave full credit for all that had been done by the several municipalities during the 10 or 12 years of their existence, and acknowledged the very great sanitary improvements they had already effected, improvements which had greatly altered and materially benefitted their towns, but at the same time I drew their attention to the fact that with few exceptions all those improvements and alterations were mostly confined to the public thoroughfares and places of business resort, whilst the dwelling quarters in which the mass of the people lived, the houses in which they were born and brought up and died, were as yet hardly affected to any appreciable extent by the improvements above alluded to. I invited their serious consideration on this subject, and urged upon them the duty of their bringing the dwelling quarters of their towns up to at least the same standard of cleanliness that they had successfully created in their public thoroughfares and business resorts.

The native gentlemen I met on these occasions were, on the whole, a remarkably intelligent body of men and thoroughly alive to their own interests. They received my observations and advice with attention and in very good part, and I am encouraged to hope that, stimulated by the example of private individuals amongst them, who have introduced into their houses various innovations in respect to ventilation, lighting and scavenging, they will in their respective municipalities soon succeed in organizing a system of general conservancy and sanitation to include all parts of the town and municipal limits on an efficient scale and properly supervised.

The want of proper organization and supervision, the great fault that attracts attention in almost all municipal towns.

67. The great fault that has attracted my attention in almost all municipalities, and which accounts for the several evils and defects I have had to bring to notice in my inspection reports of their sanitary condition, is the want of proper organization and supervision even in some instances where regular conservancy establishments are maintained at considerable cost to the municipal funds. As a rule the conservancy establishment in most municipal towns is neither efficiently organized, nor properly supervised. Nor is it in most instances worked in the economical manner that it should and would be, did it enjoy the patronage and consideration due to it on the part of the native members, especially of the Municipal Committee.

Earnestness of purpose necessary on the part of municipal committees for the attainment of a thorough system of conservancy in municipal towns.

68. So far as my experience goes, the municipal towns of this Province have within themselves all the requisites for the attainment of a very thorough system of conservancy, if only those who are entrusted with the duty of its execution would take up the subject with the earnestness of purpose which its importance demands. At present, owing to the prevalent indifference of the native members of many of the Municipal Committees to this subject of town conservancy, the

most simple and easily executed measures of scavenging are neglected, not only to the direct injury to the wholesomeness and salubrity of their towns but to the detriment of their municipal revenues.

With few exceptions it is the rule for municipal conservancy establishments to restrict their operations to the service of the public thoroughfares, bazárs, and latrines, and to leave the conservancy of the rest of the town to the care of the individual householders. In many towns the conservancy of that portion of them not undertaken by the regular municipal establishment is farmed to a contractor who pays for the privilege of removing for disposal to his own advantage its garbage and street sweepings, but without undertaking any responsibility in the matter of keeping it in a clean or wholesome state.

Again, the municipal conservancy establishment, almost everywhere in towns of the 2nd and 3rd class, lacks proper organization and supervision. The Inspector to whom is left the general control and working of the establishment is usually appointed without any test of his qualifications for the office, and the sweepers under him are in many instances found to be physically unfit for the work required of them. It is not at all uncommon to find old, half blind, and infirm men, or else mere boys of twelve or fourteen years of age, in the ranks of the municipal conservancy establishment; whilst they are never provided with any tools for the work they are expected to do, nor are they set about their duties in a methodical manner. In fact, there is an absence of system and method which seems to me to be attributable to lack of interest and consideration on the part of the Municipal Committees. In no other way, considering the 10 or 12 years' experience they have had in the practical working of their conservancy establishments, which are more or less directly under the control of the civil authorities, can I account for the generally very unsatisfactory condition of the dwelling quarters of these towns, when too commonly a few steps carry one from clean-swept, well-drained, and airy streets, into alleys and lanes with just the opposite characters. It appears to me that what has been found practicable in the public streets and bazárs can without difficulty be extended also into the private dwelling quarters; and I consider that the time has arrived for the Municipal Committees, as guardians of the sanitary interests of their fellow-citizens, to take up this matter with seriousness of purpose, and to remove from themselves and their townsmen the reproach of preferring to live in the midst of filth and discomfort rather than trouble themselves with the exertion of devising measures for their substitution by cleanliness and comfort. And the more so since there is no real difficulty in the matter, all the requisite means and agency being available on the spot, the only thing wanting being energy and determination to utilize them to the best advantage.

Plan adopted for town conservancy and sale of sewerage by the Amritsar Municipality recommended for all towns.

69. It is impossible to lay out a scheme of town conservancy which shall be applicable in all its details to every municipal town, but I venture to suggest for the consideration of all Municipal Committees a plan which it appears to me commends itself to their attention by reason of its easy practicability generally and adaptability to the special requirements of any particular town.

The plan I would suggest is that all Municipal Committees should, as is done with such successful and profitable results by the municipality of Amritsar, monopolize the whole of the sewage and street sweepings, stable litter, house garbage and latrine soil of their respective towns, and dispose of it by sale for the benefit of municipal funds. If this measure is carried out with system, method, and economy, it will not only vastly improve the salubrity, wholesomeness and general sanitary condition of their towns, but it will materially add to the sum total of their annual revenues, and to a very great extent pay the cost of the increased conservancy establishment required for its execution.

Statement showing the approximate amount that may be realized by sale of sweepings in the principal towns taking the results achieved at Amritsar as a standard.

70. Subjoined is a statement showing the sum that may in round numbers be annually realized by the following principal municipal towns from the sale of their town sweepings, &c., either as manure for the fields or fuel for the brick kilns, taking the results achieved at Amritsar as a standard for guidance.

1.	Delhi	...	25,000	26.	Kartárpur	...	2,000
2.	Do. Suburbs	...	9,000	27.	Ráhon	...	2,500
3.	Sonepat	...	3,000	28.	Hoshiárpur	...	2,500
4.	Farukhnagar	...	2,000	29.	Tánda and Urmar	...	3,000
5.	Rewári	...	5,000	30.	Amritsar	...	30,000
6.	Firozpur	...	2,000	31.	Batála	...	5,500
7.	Palwal	...	2,500	32.	Siálkot	...	7,000
8.	Karnál	...	5,000	33.	Lahore	...	20,000
9.	Kaithal	...	3,000	34.	Do. Suburbs	...	8,000
10.	Pánipat	...	5,000	35.	Kasur	...	3,500
11.	Hissar	...	3,000	36.	Gujránwála	...	4,000
12.	Hansi	...	2,500	37.	Wazirabad	...	3,000
13.	Bhiwáni	...	7,000	38.	Ferozepore	...	3,000
14.	Rohtak	...	3,000	39.	Rawalpindi	...	4,500
15.	Jhajjar	...	2,000	40.	Pind Dádan Khan	...	3,000
16.	Sirsa	...	2,500	41.	Gujrat	...	3,500
17.	Umballa	...	5,500	42.	Jálalpur	...	3,000
18.	Jagádhri	...	2,500	43.	Bhera	...	3,000
19.	Shahabad	...	2,000	44.	Mooltan	...	6,000
20.	Sádhaura	...	2,000	45.	Do. Suburbs	...	4,500
21.	Rúpar	...	2,000	46.	Maghiána	...	3,000
22.	Ludhiána.	...	8,500	47.	Chiniot	...	2,500
23.	Jagraon	...	3,500	48.	Dera Ismail Khan	...	4,000
24.	Jullundur	...	7,500	49.	Dera Gházi Khan	...	4,000
25.	Ditto Suburbs	...	3,000	50.	Pesháwar	...	12,500
				51.	Kohát	...	2,000

71. To ensure the like results, however, it will be necessary to organize the scheme on a commensurate basis, and to provide for its thorough execution by as proper supervision and control as may be considered necessary for each municipality separately. These ends, I think, may be attained by some such procedure as the following:—

Suggestions for the organization of the scheme with a view to ensure like results in municipal towns.

1*st*.—To prepare a plan of the town and suburbs including the area within municipal limits.

2*nd*.—To divide the urban and suburban areas into " sweeper beats, " each of which is to be furnished with its own gang of sweepers under a mate, who shall be held responsible for the proper working of his gang, and the efficient conservancy of his beat.

3*rd*.—To provide each gang with a distinctive badge or number indicating the " beat " to which he belongs.

4*th*.—To provide tools, such as baskets, brooms, and shovels for the work of the streets, and carriage, such as carts, donkey or bullock-panniers for the conveyance out of the town of the stuff collected by the sweepers.

5*th*.—To provide " refuse godowns " at convenient sites outside the town for the storage of its sweepings, &c. These godowns to be merely plots of ground enclosed within mud walls, 3 feet high. Such an enclosure, 50 or 60 feet square, would suffice for the sweepings, &c, of a single beat during a year, as portions would be from time to time disposed of by sale as fuel for brick kilns, or as manure for the fields. If not so disposed of, and the material collecting beyond the capacity of the enclosure, its bulk can be easily reduced by firing the coarser and more bulky stuff without injuring its value as a manure.

6*th*.—To provide " garbage boxes " for the principal streets in the dwelling quarters. The "garbage box " to be 4 feet long, 2 feet wide, and two feet high, with a lid but no bottom, and to have a handle at each end for tilting up, so as to remove the contents from the ground covered by it. The object of the " garbage box " is to receive and shelter, till removed by the sweepers, the house sweepings, kitchen refuse, &c., which under the existing system is cast in a heap on the street side, and is as often as not scattered over the street by the passing traffic before it can be removed by the sweepers.

7*th*.—To appoint a clerk for the supervision of the refuse godowns and sale of their contents, the transactions to be made at the municipal office, and registered in a special account book, the manure or fuel being delivered at the godown on presentation of a cheque specifying the quantity to the peon in charge there.

72. As a guide to the control and discipline of the conservancy establishment, I annex a copy of the rules in force in the Amritsar Municipalitiy, where they are found to work very satisfactorily:—

Amritsar conservancy rules given as a guide.

Rules for the Guidance of the Conservancy Establishment.

1. The conservancy establishment shall consist of :—one Darogha, three Naib Daroghas, one Mohurrir, and as many other Munshis, Jemadars, Duffadars, Lumberdars, Peons, Bhishties and Sweepers as the Sub-Committee may appoint, provided that the cost of such establishment shall not exceed the budget provision of the year.

2. (*a*.) The appointment, dismissal, or other punishment of the Daregha, Naib Daroghas, Mohurrir, Munshis and Jemadars, shall be governed by the terms of para. 21 of the of rules of business.

(*b*.) The appointment, dismissal or other punishment of the Duffadars, Lumberdars, Peons, Bhishties and Sweepers shall rest with the members of the Sub-Committee of Conservancy.

3. The Jemadars, and the other members of the establishment mentioned in para. 2 (*b*) above, are directly under the orders of the members of conservancy divisions.

4. It will be the duty of members of conservancy divisions to see that the establishment is kept up to its proper strength, that it performs its duty in a proper manner, that the cleansing of the public streets and drains is properly attended to, and that all orders of a special or general character issued by the President, the General or Sub-Committee are properly carried out,

5. The Darogha, Naib Daroghas and Mohurrir not being attached to any particular division, will be directly under the orders of the Secretary, as the Executive Officer of the Committee; at the same time they shall be bound to obey any order connected with their duties given to them by members of conservancy divisions, provided such order is not contrary or opposed to any previous order given to them by the President, the Secretary or the Sub-Committee.

6. The Darogha will be held primarily responsible for the proper conservancy of the entire city. He shall be held responsible by members of divisions in the first instance, that a proper supervision is exercised over the Jemadars, Bhishties and Sweepers in the performance of their duties.

7. The Naib Daroghas are subordinate to and under the orders of the Darogha.

8. The supervision of all public latrines and of the conservancy of the suburbs, excluding the Civil Station and the Cantonments, shall be the duty of the Naib Daroghas.

9. In summer, *i. e*, from 15th April till 15th October, the cleansing of the public streets, drains and latrines shall commence at two o'clock P. M., and 5 o'clock P. M. ; and during winter, *i. e*. from 16th October till 14th April, at 4 o'clock A. M. and 3-30 o'clock P. M.

10. In each division a place of assembly shall be appointed by members of divisions at which, at the time fixed in the preceding para. 9, the conservancy establishment shall assemble and be told off by Jemadars to their respective beats. Any member of the establishment not present at the assembly to be reported absent, unless he reports himself within a reasonable time after the hours fixed in para. 9 to the Jemadar of his division, and shows good cause for his absence.

11. When the establishment has been told off to duty as prescribed in the preceding para. it shall be the duty of the Darogha, Naib Daroghas, Jemadars and Duffadars to patrol each division to see that the members of the establishment are at their respective posts and doing their work properly.

11*A*. Every evening after the day's work has been done, the Jemadars of divisions shall bring the day's muster roll to the sadr office, for incorporation in the general register of daily attendance. He shall be held responsible for any errors or false entries that may then or afterwards be detected in such lists.

12. The sweepings of private houses and of public streets and drains must be removed to the intra-mural godowns before sunrise, and from thence to the extra-mural godowns with the least possible delay.

The *Mehteranees* of private houses to be warned by Jemadars, that the sweepings of the houses under their charge must be collected at the appointed places, to admit of their removal to the intra-mural godowns before sunrise, under the penalty of being prohibited from exercising their calling.

13. The removal of filth from the intra-mural godowns shall be under the supervision of the Darogha, and he will be held responsible that no delay is allowed to occur in its removal to the extra-mural godowns, which shall be under the charge of the Naib Daroghas.

14. Deposits of filth at the intra-mural godowns should be sprinkled over with a little white (slaked) lime, and the locality after the removal of the filth should be well cleaned, and some dry earth, with which white or slaked lime shall be mixed in the proportion of one-half, sprinkled over it.

15. The three extra-mural godowns shall be under the charge of the Naib Daroghas, and to each a Munshi (*Mohâfiz*) and Peon are attached.

Sweepings from the intra-mural godowns shall be taken out of the city by three gates, *viz.*:—Lahori, Gilwalli and Ghi Mundi. At each of these gates a peon is stationed, whose duty it is to note down the number of donkey and cart-loads of manure that leave the city daily, and the names of the donkey drivers and cartmen. The daily total to be compared every evening in the presence of the Darogha and Naib Daroghas at the sadr office with the list of the Godown Munshi (*Mohâfiz*). Any discrepancy to be at once brought to the notice of the Secretary.

16. The extra-mural godowns shall be closed for the months of June, July, August and September of each year, and the daily deposits shall be covered with a thin layer of earth form 3 to 4 inches thick.

17. During the open season, that is, form October till May, the godown Munshi shall keep a ledger, showing the number of donkey-loads of manure sold to each purchaser. Each day's sales shall be reported to the sadr office, where they will be entered in a "sales ledger," similar to the one kept up by the godown Munshi. Each daily report of sales must be verified by the signature of the Naib Daroghas.

18. When a purchaser has received the number of loads paid for, his account shall be closed until a further cash payment is make. Any excess issues over what has been paid for shall be at the personal debit of the Naib Daroghas.

19. The selling rate of manure, per hundred donkey-loads, shall be fixed from time to time :—the price being regulated by the demand. The size of the bags (*boraks*) used by the purchasers to be the same as those used by the Committee. The use of bags of a larger size is prohibited.

20. There are three donkey-enclosures : each is under the charge of a Munshi (*Mohâfiz*), who is responsible for the proper care and custody of the donkeys and their trappings ; the supervision of these men shall be under the Darogha.

It shall be the duty of the Munshis in charge to see that the donkeys leave the enclosures at day-break for the different divisions properly supplied with trappings and with the proper complement of drivers. The name of each driver and the number of donkeys made over to him to be noted down on the donkeys leaving the enclosure. On the return of the donkeys to the enclosure the list should be referred to with a view to ascertain that none are missing. The donkeys should at the same time be examined to see that they have received no injuries, and that their trappings are complete.

21. When it appears to the Munshi that a donkey has received injuries during the time it was in charge of the driver, a report should at once be made by him to the Secretary through the Darogha, stating the nature of the injuries received and by whom inflicted. When trappings are found missing, new ones to replace them should be ordered through the Darogha, and the cost recovered from the pay of the responsible driver.

22. The contractor for the supply of food to the donkeys shall convey it daily to the enclosures, where it shall be weighed in the presence of the Darogha, or in his absence the Naib Darogha, and the Munshi in charge of the enclosure, and be made over to the charge of the latter, who will be held responsible that it is given to the donkeys at the hours appointed from time to time according to the season of the year.

23. Should the food supplied by the contractor appear to the Darogha or Naib Daroghas to be of an inferior quality, a report of the fact should at once be made to the Secretary, and a sample sent to him with the report.

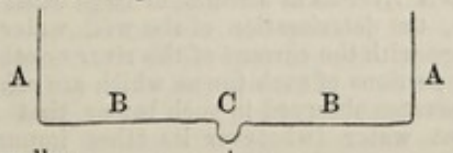
These arrangements apply to the solid matters of the streets and houses, sweepings of courts, cattle yards, &c, and should include every kind of refuse matter which is not liquid. They apply also with slight modification to the excreta removed from latrines, whether public or private, the only precaution necessary being to prohibit the filling of such soil into the "garbage boxes."

The provisions necessary for disposal of liquid sewerage different to those for disposal of solid matters.

73. For the liquid sewerage other provisions are necessary. In those towns which have a system of open surface gutters, the house sinks should be connected with them, and the flushing and sweeping of both be performed daily by a separate gang of bhistis and sweepers. With the cleansing of the sinks and gutters should be included that of the house *parachute* gutters and well conduits &c., and for this service the sweepers should be provided with brooms aud mops and wooden scrapers. In those towns which are still unprovided with street gutters, the sinks must be kept clean by daily carrying out their contents as it is at present done by hand removal in jars or by bullock *pakhâls*.

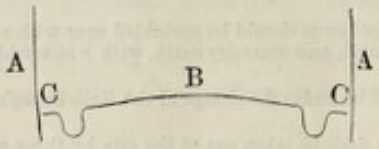
The old and new system of laying down surface gutters in municipal towns illustrated by diagrams.

74. The introduction of surface gutters in the streets is now an acknowledged necessity, and they are being gradually laid down in most towns as the funds become available for the purpose, but there is a want of uniformity in the plan on which they are laid down. In several towns the new gutters have been laid down on the old and faulty native plan, which is a mere shallow groove along the middle line of the street, the surface of which slopes from each side to it as represented in the subjoined cross section diagram.



A. A. Line of house walls.
B. B. Roadway of street (paved).
C. Midline open gutter.

The faults of this plan are self-evident. The gutter cuts the roadway, and is itself very soon destroyed or injured by the traffic of men and cattle and occasionally wheeled vehicles. But besides these defects it has the great fault of perpetually keeping the roadway in a filthy state with little streams of sewage spreading broadcast over its surface as they flow from the houses on each side to the midline gutter. This plan which is already abandoned in most towns should be authoritatively condemned in all, and as occasion offers should be replaced by the convex roadway and side gutters as the plan illustrated in the subjoined cross section diagram.



A. A. Line of house walls.
B. Convex paved roadway.
C. C. Open side gutters.

75. The merits of this plan are self-apparent. The gutters run at each side of the roadway, which is left clean for traffic, and receive direct the sewage and waste water issuing from the houses on either side. In the old fashioned plan these liquids are for the most part soaked into the soil by reason of the fractures and indentations in the course of the gutter and on the surface of the roadway, and leave in those depressions more or less thick deposits of foul, black sewage sludge.

The advantage of the new system remarked upon.

The new system offers facilities for the avoidance of these evils, and wherever introduced, has been approved as a very great improvement. It affords an easy exit for house sewage and waste water, and, when properly attended by daily flushing and sweeping, in no appreciable manner affect the atmosphere of the street which under the old system is invariably more or less strongly tainted with foul odours and exhalations. Were this new plan of paving and draining the streets universally carried out in all towns, it would not only, apart from its own advantages as a roadway, do much towards facilitating the work of their scavenging and general conservancy, but would very promptly ameliorate the existing conditions of their unwholesomeness and insalubrity. And this by the quick removal to a distance outside the town of the foul matters which through the faults of the old system now remain behind to pollute the air with their exhalations or to contaminate the well water by percolation through the soil. It is this latter, the percolation of sewage through the soil, which is the most active and widespread cause of the impurity of the well water in most towns. And the impurity may be considered as effected in two ways, *viz.*, either by the direct flow into a well of liquid sewage, through some accidental channel of communication, or by the gradual percolation to the well tube of rain or other water from the surface carrying with it the salts dissolved out of a sewage saturated soil, or a soil containing the salts derived from decomposed animal matters of old date.

In either case the risks from these causes of water poisoning will be very materially diminished by the adoption of the convex roadway and side gutters in place of the old fashioned concave roadway and midline gutter. Indeed the direct and immmediate advantages of this new system are so plain and so great, both in an economical and sanitary sense, that I feel bound to recommend it to the earnest and early attention of the several Municipal Committees in whose towns the plan has not yet been introduced, and I would strongly urge these Municipal Committees by which the measure has already been adopted to lose no time in providing for its extension throughout all parts of their towns. It is the safest means they have (house sinks being connected with the street side drains) of protecting their well water from the impurities it now receives through the soil; and, coupled with a good scavenging it is the most easy and expeditious, and consequently most economical, way of preserving the cleanliness of the streets and wholesomeness of their atmosphere, whilst at the same time it furnishes a durable, easy and comfortable roadway, the passage along which is not (as in the other case) necessarily attended with pollution to the person or clothes.

The sources by which the well water in municipal towns have become deteriorated commented.

76. Owing to the want of some such means for the protection of the soil from the daily sources of its contamination by the excreta and refuse matters of animal and vegetable life located upon it for a long series of years, there is hardly an old town in this Province, the well water of which is not more or less deteriorated by the admixture of impurities derived from the sources above indicated. In some which have the good fortune to be situated on porous ground which is traversed by a constant stream of running water such as a river as at Jhelum, or large canal (provided the latter be below the level of the town) as at Mooltan, the deterioration of the well water from these causes is reduced to a minimum by its periodical change with the current of the river or other stream during seasons of floods. This is the case at least in those portions of such towns which are affected by the underground current of the river, for it is in many instances observed in such towns that those wells which are near the course of the river contain sweet water (whatever its other impurities), whilst that of those in the distant quarters is often of a more or less brackish quality. In such towns as have no running stream near them, it is observed that the water in their wells is progressively brackish; some have become so briny as to be altogether unfit for any useful purpose; others are known to be turning so, and others again have entered on the first stage of this sort of contamination as is evidenced by the growing

mawkishness in the taste of their water. In the ancient town of Thanesar, the water in almost every one of its 500 wells within the town area is more or less brackish, and in some it is intensely so, whilst that in those at a few hundred yards distance in the field around is sweet. In the towns of Ludhiána and Wazirabad, each of which is situated upon the bank of a low and sluggish stream, which is annually flushed by the flood of the river with which it is connected, all the wells along the bank of the stream are free from brackishness, whilst several of these at the opposite end of each town are more or less distinctly saline.

Though the absence of salinity from the water of the wells in the vicinity of the stream in each of these towns may be taken to indicate an annual washing of their tubes by the flood current, it does not in any way indicate that the water in them is otherwise free from impurity during the rest of the year when there are no floods. On the contrary there is abundant evidence to shew that it is more or less generally charged with sewage matters, the stream (in each case) with which they are in under-ground communication being the receptacle of the sewage of the town. Both at Ludhiána and Wazirabad the main sewers of the town empty direct into this sluggish stream of each, and in each the current is so slow that the water has the appearance of being stagnant, whilst a considerable portion of its wide bed is at each side indented by little bays of marsh or belts of swamp. This state of the well water on the course of these streams lasts during 7 or 8 months of each year, the degree of its impurity gradually increasing as the flood season approaches, when the whole is washed away, and replaced by a fresh supply, which in turn undergoes the same process of deterioration till the advent of the next flood, and so on from year to year.

77. What is above described as operating in the towns of Ludhiána and Wazirábad to affect a considerable portion of their well water-supply, occurs to a much greater extent in the town of Karnál. Here there is the Western Jumna canal flowing close to the town and at a higher level than its site, which itself is water-logged, and so low lying that there is no exit for the sewage produced within the town walls. The sewage consequently sinks into the soil, and mixes with its well water, which is very slowly changed owing to the sluggish movement of the under-ground current. The result is that the water-supply of this town is constantly more or less contaminated by sewage.

The causes that operate to deteriorate the water-supply of Ludhiána and Wazirabad occur to a greater extent in the town of Karnál.

78. The true remedy of these evils is to be sought for in an efficient system of drainage, but this, owing to the local circumstances of each place, is not attainable except by the means of engineering works on a great scale, on a scale which is quite beyond the municipalities concerned. But this is no reason why the municipal authorities should remain idle, and neglect to do whatever may be in their power to remedy or ameliorate the very serious evils by which they are surrounded and year by year decimated. Much may be done towards lessening the amount of sewage and other impurities that at present find their way into the water-supply of their wells by perfecting a system of surface gutters to include the whole town area and conduct through an out-fall drain or sewer to some distant site from the town, these to be utilized in field irrigation or to be dissipated by evaporation on a broad surface of waste land.

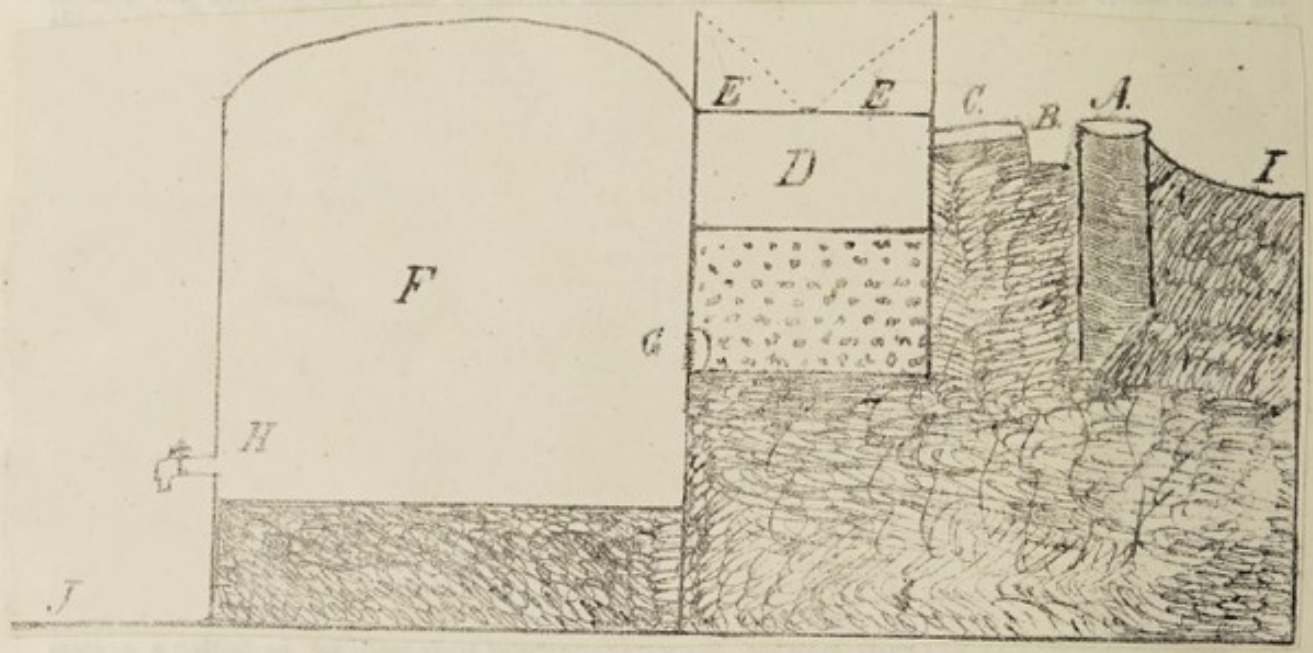
An efficient system of drainage the true remedy for the evils above described.

79. The good effected by such a system of sewerage should be supplemented by a well organized and thorough system of scavenging, to include not only all parts of the town and suburbs but the whole area within municipal limits; the material collected in this process to be economized and sold as a municipal monopoly for the benefit of the municipal funds. Both these systems being properly arranged for and being regularly worked, the common sources of water impurity would be very greatly diminished at the same time that the atmosphere of the town would be freed of noxious exhalations, and its streets be rendered clean and wholesome thoroughfares. For the rest the water used for drinking and culinary purposes should be still further purified by direct treatment with filters. This is probably done to a small extent in individual households, but the advantages of a pure or wholesome water-supply for alimentary purposes is so self-apparent and naturally preferable that its supply wherever practicable should be made available to the community generally, and it should be held to be one of the most important of the public duties devolving upon the municipal authorities to make provision in this direction for their townsmen. The provision of means of filtering the well water is an easily practicable measure and one which is by no means expensive nor difficult of accomplishment by the construction of filter tanks and water cisterns in connection with the public wells. I strongly recommend this means of purifying their well water to the consideration of Municipal Committees generally in whose towns there is not already some provision made for the purification of the water-supply. I venture to submit a plan which it appears to me is easily worked and is well within the means of the smallest municipality. What I think might be easily carried out everywhere is the construction of a cistern and filter tank in connection with the parapet or platform of such public wells as are much frequented. In many towns the well parapets are provided with open cisterns or reservoirs, but as these are never attended to, they soon become so filthy that their use is abandoned, and they remain as not only useless but positively harmful appendages about the well platforms. These might be easily utilized in the construction of the filter tanks and cisterns now proposed, and decorated with cupolas &c., in harmony with the architecture around, whilst in those towns where these cisterns do not exist, they might be constructed in a variety of forms, which whilst preserving their own utility might at the same time serve as ornaments of the town or public thoroughfares.

To an efficient system of drainage should be supplemented a well organized system of scavenging.

80. The main points to be borne in mind in the construction of the proposed filters are simplicity combined with efficiency and capacity sufficient to meet the ordinary daily demand. The filter tank itself need not be nearly to the same size as the attached cistern or reservoir, though it should not be too small in proportion. The filter tank and reservoir should be both built of masonry, and cemented inside with a coat of strong lime cement, and both should be carefully covered over. The filter tank with folding shutters to admit of its periodical cleansing, and the reservoir with a masonry vault or other architectural design in which there is provision for a small window or ventilator. The annexed diagram gives a rough idea of the plan on which the filters proposed will work.

The diagram of the filter tanks proposed to be introduced in municipal towns and the means for constructing the same.



A. Mouth of well.
B. Small feeder tank.
C. Conduit from feeder to filter tank.
D. Filter tank with filter bed of sand &c.
EE. Folding shutters of filter tank.
F. Domed reservoir for filtered water.
G. Series of holes in bottom of partition wall between filter tank and reservoir for passage of filtered water. It is protected by a wire gauze screen.
H. Stop-cock for drawing filtered water.
I. Platform of well ascended by steps from street.
J. Level of public street.

The filtering bed should consist of a layer of broken pottery at the bottom, over this a layer of charcoal, then a layer of roasted river sand, then a second layer of charcoal, and on top a layer of crushed quartz. This filtering bed should be renewed with fresh materials at least once a month or oftener as may be found necessary. It will not only remove much of the common impurities of drinking water, but will very materially lessen the salinity of brackish water, and where the salts are not in great quantity, restore it to its original sweetness. There is a filter tank and reservoir working on this plan in the town of Haripur in the Hazára district. It is fed from a canal cut close by, and the turbid water entering the filter tank is drawn at the stop-cock of the reservoir in a perfectly clear and sweet stream. To prevent waste from careless or ignorant handling the stop-cock tap might be advantageously replaced by a spring button tap such as is used in hydrants.

The plan can be altered, improved or enlarged according to desire, but the simpler the work the better. After the filter is once set a going, all that is required in the way of permanent establishment is a single *bhisti* to keep the filter tank constantly supplied from the well in connection with it. And if the reservoir is first fully stocked before drawn upon, it would suffice to fill the filter tank daily,

morning and evening, supposing it to be one-third the capacity of the reservoir. Where the filter tank is fed from a canal cut, one *bhisti* would suffice for the care of two or three. All these details, however, can be better arranged by individual municipalities according to their several requirements. What is here desired to impress upon the attention of the Municipal Committees is the necessity of their making some such sort of provision for purifying the water their townspeople are dependent on for drinking and culinary purposes. There is no doubt that the introduction of such filters for public water-supply (attached as they might be to the principal wells, from which the people now draw their daily supply) would prove of immense benefit to the general health of such towns as Rewári, Thanesar, Karnál, Ludhiána, Jullundur, Amritsar, Wazirabad &c. &c., and as the cost of their construction is well within the reach of the municipalities, whilst their management requires no skilled labour, there can be no reasonable difficulty in the matter of their general adoption. Probably Rs. 300 or Rs. 400 would cover all the expenses of constructing one of these filters, and each reservoir might be furnished with 2 or 3 different taps on different sides to suit the prejudices of the different creeds.

Rules for the improvement of village conservancy.

81. In para. 92 section VI of my Sanitary Report for last year are recorded the "Rules for the improvement of village conservancy" which I submitted to Government in my last inspection report of that year. For facility of reference they are here repeated, *viz.*—

1*st.*—For storing village filth and refuse matters of all sorts on fixed sites defined and protected by low boundary walls at a distance of at least 200 yards from the walls. Their number might correspond with that of the village lambardárs, who might superintend the partition of the mass when required as manure for the fields, &c.

2*nd.*—For protecting all wells and tanks or ponds from pollution from whatever cause arising, and in the case of the latter from dung heaps formed on their banks or in the vicinity.

3*rd.*—For preserving the open ground round about the village from collections of dirt or filth of any kind and from the excavations of its soil.

4*th.*—For filling up and levelling all hollows or pits not absolutely necessary as drainage reservoirs, and the maintenance of these latter free from deposits of filth and rubbish.

5*th.*—For the burial of the carcasses of dead cattle at a suitable distance from the village, and the demarcation of limits within which offices of nature shall not be performed.

6*th.*—For the maintenance of cleanliness in the village streets and cattle pens and yards.

The enforcement of these simple rules in their integrity amongst the rural population has been considered by a few Deputy Commissioners, in their sanitary reports for 1878, to be a matter of impossibility without compulsion. There is no doubt some difficulty in the matter, but at the same time I do not consider that it is of a nature to demand compulsory enforcement. The rules, it appears to me, will be worked much more satisfactorily and efficiently by securing the good will and co-operation of the people themselves, and these *desiderata* can only be attained by bringing home to the understanding of the peasantry the direct and immediate advantages they will individually derive by their adoption and enforcement amongst themselves as a matter of personal benefit, and altogether apart from state requirements. Much might be done in this direction by the distribution to village headmen of printed copies of a few simple sanitary rules for the conservancy of their villages, the ventilation and cleanliness of their dwelling houses and cattle sheds, and general sanitation of their country homes. Should this proposal be approved, a small pamphlet embodying such rules and simple illustrations of their applications might be prepared in this office so as to ensure uniformity of instruction and action in all quarters.

Procedure adopted by Major Harcourt, in the matter of village sanitation well suited to the initiation of the measure.

82. The procedure adopted by Major A. Harcourt, Deputy Commissioner of Lahore, in this matter of village sanitation appears to me well suited to the initiation of the measure, and I give herewith a copy of his letter of instructions to the officials charged with its execution:—

TO ALL TAHSILDARS.

"I forward a translation of 191 of 13th January 1879 from Secretary to Government with an extract, para 92 from the Sanitary Administration Report for 1877.

The points you have to see to are clearly defined, and the procedure you will adopt is as follows:—

I. Make a list of some 20 of the larger villages in your tahsil.

2. In turn call up the headmen and more influential people, and carefully explain the six points in the circular. Tell the headmen that the Deputy Commissioner wishes to work with them, and not to bully them into doing what is so essential for their own health and comfort.

3. Ask the headmen of each village the spot or spots they will propose to give for storage sites. Have this spot or these spots clearly marked on the village map, remembering that the same should be about 200 yards from the village wall. Place each storage site under the care of a lambardár, and tell him he must be responsible for the filth of his *Patti* being deposited there.

4. Arrange with the lambardárs when the manure can be taken away, and tell the lambardárs, that the manure should be disposed of, and the proceeds put into the Malba Fund, or that each Pattidár should have his share of the manure. Whatever arrangement is made should be recorded.

5. Each lambardár will be held responsible that all wells, tanks, and ponds are free from chance of pollution by dung heaps being allowed near them.

6. Each body of lambardárs in a village will be held responsible for not allowing dirt and filth to be collected in any place except in the storage sites, for keeping the open ground round about the village clean and for preventing holes and excavations being made, causing all such now existing to be filled up.

7. Each lambardár or body of lambardárs to be careful they allow no carcasses of dead cattle to be buried within 100 yards of the village.

8. To fix a distance of so many hundred yards, say 200 yards, outside of which all offices of nature must be performed.

9. The lambardárs should be asked whether they cannot arrange to erect from the village Mulba latrines for men and for women, surrounded by a mud wall.

10. The lambardárs are also to see that in village streets and cattle pens cleanliness is maintained.

The Tahsíldár will explain to the lambardárs that the District Committee has heard read the Secretary to Government's letter, and are desirous of enforcing the wishes of the Government. And he will also explain carefully and *kindly* to the headmen that the Deputy Commissioner has this subject much at heart. That the Depaty Commissioner knows that the actual enforcing of these rules in all their integrity is an impossibility unless he has the people with him, and finally that those who show good results and clean villages will be given certificates, and that the Deputy Commissioner will only be too glad to treat with all honor and consideration and kindness those lambardárs who are forward in this most necessary work. Th se who do well will be brought to the notice of the Government.

And when a fitting opportunity arrives, the Deputy Commissioner will see those who have done well in Durbár, and will honour them in the most public and gratifying manner.

When you have made lists of the 20 villages, and have seen the lambardárs and headmen and made arrangements as pointed out, then I shall feel obliged by your reporting what you have done to me, giving a report for each village, the place fixed on for the storage site and all such particulars. A return to be sent to me by 1st March 1879."

SUMMARY OF INSPECTION REPORTS.

Simla Sanitarium.

Inspected by Dr. J. C. Courtney, *on 28th Septmber* 1878.

New market.

The new market has been in operation for the last 2 or 3 months. The building appears to be very well adapted to its purpose. It is light, airy and well ventilated. The butchers' stalls were nearly all occupied, they are well provided with tables, benches and hooks for cutting up, and exposing meat for sale. No meat was to be seen on the floor. The meat both beef and mutton appeared to me to be of good wholesome quality, and I was informed that all animals are carefully inspected before slaughter. Water is laid on by pipes from the spring at Combermere bridge. The whole place was remarkably clean and quite free from any unpleasant smell. The absence of flies about the meat was especially noticeable. The adjoining vegetable and fruit market in the old covered racket court, a lofty and spacious building, was also remarkably clean and well supplied with a profusion of wholesome looking garden produce. In both markets purchasers seemed to be numerous, and trade brisk. I also saw in separate blocks near the market some very spacious and comfortable rooms occupied at a moderate rent by the market stall-keepers, a great contrast with the native shop-keepers' usual quarters in a dirty house in the midst of his goods.

Municipal bakery.

A little below the market is the municipal bakery, a row of small rooms each containing tables for kneading dough and an oven for baking the bread. Here also water is laid on by pipes. The work of kneading was going on, and although the place was remarkably clean, the process of working up the dough by a number of freely perspiring workmen was not particularly attractive. I understand that a steam power bakery is soon to be established, a very desirable improvement upon the present system. One point about the bread making which urgently requires reform, is that the flour (sooji) from which the bread is made, is all prepared in a mumber of miserable hovels in the bazár. All the work is done on the ground, the huts are exceedingly dirty, and swarm with children in addition to the persons employed in grinding and sifting. Disease is very likely to exist among these people, and it would seem to be almost impossible under present arrangements to preserve the purity of the flour made by them. Mr. Goad, Secretary to the Municipal Committee, who accompanied me during my tour of inspection, informs me that arrangements are now being made to provide these sooji makers with better quarters. They ought I think to be under quite as strict rules as to cleanliness as the bakers and butchers.

Bazár.

It is unnecessary to describe the manifold imperfections of the bazár. Crowded as it is with dirty tumble down huts, a group of buildings in worse condition or more unsuitable to a place chosen as a seat of the Government of India can hardly be imagined. Something has been done by removing the houses at the top of the ridge near the church, and it is intended to clear the whole of the ground to the north of the main street and also to open new streets at right angles to the existing ones; this will certainly much improve the sanitary condition of the place by admitting air and by abolishing various odd corners in which filth of all kinds is at present likely to accumulate. All new shops are now built, I believe, according to an improved plan, and those I have seen seem to leave little to be desired in appearance, space and ventilation.

Serái.

A good serái for travellers has lately been built below the market: it is clean and well kept and is much frequented.

Conservancy arrangements and public latrines.

Conservancy arrangements are now carried out as described by paras. 19-30 of the Municipal Committee Report, quoted at page 59 of this office report for 1877. The present plan can only be considered a temporary one, but so far as it goes is no doubt a very great improvement on the former system under, which I find from the annual reports of the last five years that the insanitary condition of the bazár was a matter of constant complaint. Numerous public latrines have been built during the last year. I inspected three of them, two large ones of 24 seats each in the main bazár, and a third of 12 seats just below the telegraph office. They are substantial wooden buildings, roofed with iron, having good asphalte floors, and provided for each seat with an iron tray containing ashes; privacy is secured by a door to each compartment. The iron trays are removed through openings at the back and the contents thrown into covered iron buckets which are removed when full, and disposed of as hereafter described. The floors are frequently washed. The water being received into a bucket sunk below the ground outside the corner of the latrine. There was very little smell about these places, and they were evidently well kept and attended. The number of persons using them in the early morning is said to be very large. Each private house having ground attached is now under municipal rules provided at the owners' expense with a latrine on the same plan as the large public ones. I inspected one of them belonging to the house of Messrs. Ranken & Co.,; it was not particularly offensive, but not so clean as those in the bazár. There are some hundreds of these private latrines, and effective supervision is no doubt difficult. The fœcal matter from public and private latrines is disposed of in one of three ways, (1) by burial in shallow

trenches on land taken up for the purpose, this applies only to the outlying parts of the place such as the north part of Elysium and Chota Simla ; (2) by removal in carts, each holding six large iron receptacles, to Budai ghat, a place on the cart road six miles from Simla, where it is buried in large pits ; and (3) by being deposited in a reservoir constructed in the bed of the ravine half a mile below Combermere bridge and on a lower level than any of the bazár buildings. Rain water and all liquid sewage, including bathing water and urine, are carried off in a more or less perfect manner by V shaped wooden drains, mostly set at a steep slope and ending a little below the bazar where they discharge their contents into the nearest ravine. These drains are admirable for storm water, but their use ought I think to be confined to that, they are not water tight, the wood must decay in the course of time, and the urine and other impurities find their way to a considerable extent on to the ground. I found that there was a good deal of smell about all these drains below the bazar, and in hotter weather it is no doubt much worse. I believe that it is a part of the conservancy scheme approved by Government to convey all sewage both liquid and solid by iron pipes into the ravine below the bazar, these pipes being supplied with water partly from Mahasu and partly from the existing springs at the Combermere bridge. This being the case, I would suggest that the large escape pipe intended to carry off the bazár sewage should be provided at once and connected at the top with a temporary receptacle for sewage. I believe that even with the present limited supply of water most or all of the bazár sewage might, owing to the steep slope of the pipe, be carried away in this manner without difficulty or nuisance, that there would be a great saving in labor and that there would be much less defilement of the ground than now by urine and other liquid impurities. The works for the new water-supply appear to be just at present at a stand still. The proposed scheme is in my opinion the only one at all adapted to provide an adequate supply of water. The amount of water available from the springs now in use is obviously altogether inadequate to the wants of the place, and it is very much to be wished that the Mahasu supply should be brought in with the least possible delay.

Slaughter-yard.

The slaughter-yard is divided into two compartments one for sheep and goats, the other for oxen : the first of them was in full work : its condition was fairly satisfactory. There was little smell, and there appeared to be an ample supply of water and good arrangments for removing the blood and other refuse which are carried away in iron receptacles and deposited in the ravine below. The floor was somewhat rough and uneven, that of the beef butchery was under repair, but I think too much cement was being used. The floor should be evenly laid with well trimmed accurately fitting slates and very little cement would then be required.

Ravines on the south face of the ridge foul and ill smelling.

All the ravines running down the south face of the ridge below the bazár are very foul and ill smelling. All the urine and house washings from the bazár find their way into them by open wooden shoots—themselves very leaky and imperfect, and mostly ending a short distance below the cart road. I noticed that the whole of this liquid sewage sank into the ground, and even as high up as the cart road there was an abominable smell at each point where one of these water-courses was crossed. I believe that the whole of this nuisance might be stopped by the use of iron pipes, one following the corner of each of the 3 or 4 drains now in use leading from a sink in the bazár above into which all liquid sewage should be thrown and ending in the main ravine below some hundred yards further down than the lower ends of the present wooden shoots. The slope is so great that there would be no difficulty in keeping such pipes clean and in order. The expense would be considerable no doubt, but I see no reason why this could not be made a part of the general drainage scheme and carried out in anticipation of the new water-supply. The greater part (I believe about two-thirds) of the solid sewage of Simla both from public and private latrines and from the slaughter house is finally disposed of in the large water-course below Combermere bridge at a point about 500 feet below the top of the ridge. About 300 iron buckets of this sewage, each containing about a maund, are daily brought down on the heads of sweepers to this place, and their contents deposited in a small iron cistern through which a stream of water is constantly running, both water and refuse pass out through a pipe at the lower end of the apparatus and are washed down the ravine. The work was going on actively at the time of my visit, there was some smell from the fresh fœcal matter in the iron buckets, but the stream itself, a couple of minutes after washing down a large quantity of the filth, was perfectly inoffensive and clear and bright in appearance nor was there any perceptible smell lower down the ravine. The slope is very steep and every thing seemed to be effectually carried down by the water. If, as I am informed, there are no villages or human dwellings for some miles down the banks of this stream, and, if the water is nowhere used for human consumption, there seems to be no objection to disposing of the sewage in this way, either now or as a part of the intended final drainage scheme for Simla. The road leading down to the place is steep and uneven, and a better road would lessen the labour of the sweepers—whose work is very severe.

JULLUNDUR.

Inspected on 30th and 31st October and 1st November 1878 in pursuance of His Honor the Lieutenant Governor's instructions to inquire into the state of matters in the city and investigate the causes that have given rise to the excessive sickness and mortality that had afflicted its inhabitants during the last month.

Chief features of the city.

The city of Jullundur is of ancient date, and stands upon nearly level ground, which is slightly raised above the general surface of the land around. It originally consisted of a cluster of small forts, but these have long since ceased to be distinct

centres of habitation, and the present city is the result of their growth and coalescence. It is enclosed within an irregular line of brick walls and has 9 or 10 gates, and all round outside it runs a circular carriage road which is metalled with kankar, and in parts shaded by rows of trees. With the exceptoin of some fill-up, populous and poor quarters on the southern and eastern outskirts where the tenements are mere mud huts and sheds, the houses are generally well built, and substantial brick structures which in many parts of the city form considerable piles and blocks, four or five stories in height. There are no open spaces in the interior of the town, and the houses appear to be very closely crowded together. The population of the city (census 1876) is 35,222, and that of the suburbs 15,702. The number of houses in the city was 10,526, and in the suburbs 4,840 at the time of the last Settlement, but since then there has been an increase in the number, though probably not to any very great extent. On the other hand the floods of 1876 and of this year destroyed a large number of houses, about 800 having been completely washed down. In Kot Kishan Chand the destruction has involved fully half of the populous suburbs. The main bazárs and thoroughfares are winding, and though not altogether narrow are not so airy and wide as they should be in such a town. These public roads are either paved with bricks set-on-edge or metalled with kankar, and are furnished with an open surface drain running along each side. These drains receive others from the side streets and alleys, which ramify throughout the mohalla quarters, and they finally discharge into wide ponds or cess pools a few hundred yards outside the town walls. These ponds occupy the hollows and depressions of the surface on all sides of the town, and some of them form considerable streets of liquid sewage. The two largest are situated on the north-eastern and southern sides of the town respectively, and are permanent receptacles of the town sewage in those directions through open masonry drains conducting to them either for part of, or all the way.

Public streets and main bazars.

I found the public streets and main bazárs, both as regards their roadways and drains in a clean and tidy condition, evidencing a careful service on the part of the conservancy establishment. In the side streets and mohalla alleys where the passages are almost everywhere paved with bricks-on-edge, I found the roadways generally clean and free from litter and rubbish, and the offensive deposits one generally meets with in such parts of most native towns, but I observed that the house sinks (or *chaubuchas*) were generally sunk at the side of the public thoroughfare, and considerably below the level of the roadway, and unprovided with any outlet for the discharge of their contents. These open cesspits were everywhere in a very foul state, and more or less thickly coated with sewage sludge on the floors and sides of their masonry walls. There is no provision made by the municipality for their regular service, and I was informed that it was the custom to bale out the contents on to the roadway from time to time as the sinks became full to the brim. From the condition of the sinks it is apparent that the sweepers when they do bale out the contents never think of cleaning the interiors, whilst from their faulty construction it is almost impossible to do so thoroughly and efficiently were the attempt even made. In the streets where the roadway is paved and furnished with a sewage gutter, these sinks should be done away with entirely and the house drains be conducted direct to the gutter. In other situations where the roadway is neither paved nor drained, the sinks should (if they are really necessary) be built up on the level of the roadway with a vent on the level of their floors to admit of washing out after removal of their contents, either in sewage carts, iron buckets or *pákhal* skins, and their interiors should from time to time receive a coating of lime wash.

Street sweepings.

The street sweepings and night soil are removed daily from the city and disposed of at once as fuel at the brick kilns, or deposited on the surface at appointed sites around the city skirts till taken away by the cultivators. None of these sites are enclosed. It would be advisable to surround these sites by low mud walls so as to limit the area covered by this stuff and to preserve it as a manure material from loss and damage by dissipation under the feet of passing cattle and washings and by rains and water. The heaps near Kot Kishan Chand were thoroughly washed out by the recent floods, and drained into an adjoining pond. Were the sites enclosed within low walls, the people would soon recognise them as the proper places for shooting rubbish, and the general surface would thus be protected from many unsightly and filthy heaps of rubbish, especially if fines were imposed on offenders casting filth outside the enclosures.

Mohalla interiors or private dwellings.

The mohalla interiors, that is to say the private dwellings and courts opening on to the mohalla passages and impasses are almost everywhere in a deplorably unwholesome state. I entered several of them and with a rare exception in one mohalla or two found them all in a very foul state from neglected drains, overcrowding, and neglect of even ordinary comfort and tidiness. A description of one of those I entered will suffice to convey an idea of the very insanitary condition of most of the private dwellings in this city.

A step from the street through an open door conducts to a small antechamber or porter's lodge about 6 feet by 4 and 8 high. On one side at right angles with the street door is another which leads through a few steps of low narrow passage into the court. This is a paved area (bricks-on-end) about 20 feet by 30 feet between the walls of the tenements on each side which rise aloft in tiers of 3,4, or 5 stories with no sign of any means of ventilation except through the street door, and the opening of the court over head. The surface of the court is radiated by 4 or 5 open gutters which converge from the several tenements to a main gutter which passes under the floor of the entrance antechamber to the street gutter or to a sink at the street side. The channels of these gutters are grimy with black sludge

and the pavement of the court is strewed with litter of sorts, bits of rag, refuse of chewed sugar-cane husks of washed lentils, ashes, and the scouring of pots (cooking) with a deposit or two in one or other corner of ordure left just as some inmate used the spot for purposes of nature. I mention what I saw with my own eyes, not in one but in many of the private dwellings here of people who were well-to-do and noways straitened in worldly wealth. If we look into the ground floor of one of the tenements from its door opening on to this common court, we find a front room with one or two small windows opening towards the court, and a back room with no other provision for light or air than the door between it and the front room, like which it is about 20 feet long by 10 feet wide and 10 feet high. The back room contains beds, bundles of wearing apparel, earthenware jars full of stores and household utensils of sorts, and accommodates from four to six persons adult and infant. The front room has one portion slightly sunk below the floor and coated with lime cement for purposes of ablution and scullery, and along its margin is a row of water jars, with the floor under them more or less constantly wet or damp. In one of these rooms I found six adult females and two men. The latter were up and about, but of the former four were coiled up under their cotton sheets and lying on the floor prostrated by fever, whilst the other two were scouring pots and washing soiled linen at the water jars close by. If we look in at another door opening on to the court, we shall find the same state of things, and perhaps only a flight of steps leading to the upper story and at the side of it an empty room, used as a privy in one part and as a cow stall in the other, with no opening for light or air but the door. The floor is everywhere soppy with urine and fæces, both human and animal, and the pent up air of the place loaded to an insupportable degree with sickening odours which slowly filter into the air of the court and add to the noxious effluvia rising from its own gutter and untended floor. This is by no means an exaggerated description of the state of the private dwellings in this city as a whole. Here and there one may be found with fewer sanitary defects than those above described, but many will be found in which they are worse especially in the crowded blocks. Many of the private residences have a well either altogether inside the court or else partly in the court and partly in the street, and the tenement wall running across its mouth, so as to allow of water being drawn from both sides. These private wells are generally protected by parapets from surface drainage and drippings, but they are in many instances unprovided with drainage gutters for carrying away drippings, and where these are provided they are rarely swept or cleaned, and consequently surround the well shaft with a ring of fætid black sludge. I noticed also that in many of the public wells there were sewage gutters in immediate contact with their shafts. This is very objectionable, for with the most careful attention to outward cleanliness of the gutters it must in some instances be impossible to prevent soakage from the gutter into the well shaft, especially where both gutter and well tube are much worn by decay.

Wells.

The number of wells in and about the city is about 500. During the rains and floods of this year their water rose from 5 to 9 cubits above the ordinary level, and in a few situations flowed out over the top. At the time of my inspection their water had considerably subsided, but was still said to be from 2 to 4 cubits higher than the ordinary level. A few days after the first rise of the well water its quality became so bad as to render it entirely unfit for domestic use. It is said to have acquired a disagreeably mawkish taste and faint sickly odour, and became coated with a thin oily film on being allowed to stand a few hours. Those who used this water for drinking were in many cases seized with vomiting and purging, and in consequence the municipality very wisely closed most of the wells, and restricted the people to the use of a certain number which had been cleaned out, and in which the water was held to be free from these deleterious qualities. I found these wells generally well tended, and their water perfectly clear and bright to look at, and considered by the townspeople perfectly wholesome. An analysis of the water of these wells and also of those which are closed should be made with the object of ascertaining the nature of their impurities, and I would recommend that the municipality send carefully selected and secured samples of each kind for the purpose to the Chemical Examiner, Lahore.

Municipality should bestow the same supervision to the private quarters as they do to the public part of the city.

I have said above that the clean and tidy condition of the main bazárs and public thoroughfares evidenced a careful service on the part of the conservancy establishment. This satisfactory result is attributable to an increase in the establishment. It remains now for the municipality to extend the same energy and supervision which they have bestowed upon the public part of their city into the private quarters also, for these are the real homes of the people, the place of the birth and life and death of their fellow citizens. In these dwelling quarters, which after all really constitute the city, there is every thing to be done to render them wholesome and comfortable residences. It is not anything like enough merely to sweep the public streets and leave the inner courts and gutters in a foul and grimy state of filth. An unremitting attention to the state of the drains and their service is absolutely necessary to the attainment of an efficient conservancy. The gutters and drains require to be maintained in thorough repair, and to be kept in a wholesome state by regular sweeping and flushing, so that their sewage be daily carried away outside the city. If this be properly done, the air of the mohalla will, despite their defective ventilation, be freed to a very great extent of the foul exhalations which now poison their atmosphere to the very manifest detriment of the physical health of those who live in it as is evidenced by their blanched looks and inferior bodily strength and frame in comparison with their fellows of the rural population who enjoy a fuller measure of the pure air of heaven, though they are in noway cleaner in their persons or habits than the citizen community. But apart from this improvement of the breathing air, the drinking water of the mohallas will be also improved by the adoption of such measures for the rapid and regular removal of sewage matters, because if they are allowed to stagnate, they soak

into the soil, and by dissolving soluble constituents of that earth gradually work their way deeper and deeper under ground till at last they reach the level of the well water or may flow directly into the well reservoir.

Pure air indispensable to enjoyment of sound health.

Of equal importance with the efficient conservancy of the earth about a dwelling place is that of its air; and though the former of itself helps towards the attainment of the latter, it is not alone sufficient. Without a pure and wholesome air to breathe, no man or animal can enjoy sound health or possess a robust body. Filth and refuse matters in the process of decay give off vapours and gases which are foreign to the natural constituents of the air we breathe and live by, and unless they are very largely diluted by dissipation into its space, they prove, as all experience teaches, very pernicious poisons. Where a large number of living beings are congregated together on a limited area, they produce filth and refuse matters which tend to fill the air around them with deleterious and poisonous vapours and gases and substances. These deleterious matters proceed from two different sources. The one is that of substances used by man for his sustenance, and then cast on to the ground when done with, such as the alvine and urinary excreta and the refuse of various matters used in domestic and ordinary life. The other is that of effete vapours which are thrown out from his own body continuously without intermission, and whether sleeping or waking, so long as the being has life, as the breath given out from the lungs, and the exhalations from the pores of the skin which pass directly and unseen into the air.

For the removal of the first kind of filth which is visible and tangible, the municipality has made provision in the system of drains all through the city, and in the establishment of scavengers for their service and that of the streets. This arrangement, though yet far from complete or as efficient as it should be, is of great use in carrying away and utilizing filth, which would otherwise accumulate and render the place uninhabitable.

But the municipality—and this is the point I would beg to invite its earnest attention to—has made no attempt to provide any measures for the removal of the second kind of filth above mentioned, which is invisible and intangible, though it is, as experience clearly proves, even more mischievous and fatal in its effects than the grosser and palpable sorts. I would submit for the consideration of the members of the Municipal Committee the ordinary condition of the dwelling houses of their fellow citizens, and solicit their careful attention to the main defects in their construction so far as these contribute to the accumulation and production of filth in the air of their interiors and surroundings.

On a moment's reflection it will be apparent to the intelligence of these gentlemen, that if four or five persons shut themselves up in a small room with no current of air passing through it, the air of that room will soon become disagreeably foul and close by reason of the accumulation in it of used-up air and effete exhalations from the bodies of those who are congregated together in it. The discomfort arising from this state of the air of such a room may be little troublesome to its occupants, or it may be at times very much so, and doubtless in many cases habitude blunts the perception of the senses, and the evil remains unheeded, much in the same way as one may become accustomed to the stinks of a filthy street and heedless of the warnings they convey. But practically the effects of such a foul air when continuously breathed for a long period at regular intervals as in the ordinary rest and retirement during hours of darkness, day by day, are none the less certain and apparent because they are neither heeded nor understood, for the proof of the injurious and unwholesome qualities of such foul air is seen in the inferior physical development of those subjected to its influence, and very much in proportion to the degree of such subjection, as is seen in the case of females and children who are more continuously confined to the house than are male members of the community, and who are far inferior in physical strength and health to the corresponding classes of the rural population. It is easy to understand that the dwelling of several individuals in a limited space, the air of which is confined and stagnant within impervious walls, should be not only unwholesome but directly injurious as well, because these individuals, instead of breathing a continuously flowing current of fresh air, as they naturally should do, are reduced to inhaling over and over again not only the effete air they have already exhaled, but the mixture of it with that exhaled by their companions from both lungs and skin, and the evil is intensified when, as not unfrequently is the case, some of the parts happen to be suffering from disease.

Now, in a very large proportion of the dwelling rooms of this city, judging from those I have seen in different quarters of its area, the conditions above alluded to obtain. That is to say, the air of these rooms is stagnant, especially in the case of inner rooms, because it only enters at the door and has no means of exit through any other outlet, and it is at all times more or less heavily laden with the filth vapours exhaled from the bodies of its occupants, because this foul air finds no channel of exit. Owing to this circumstance of inability to escape from the interior of the room, these filth vapours (which are always more or less moist as they are given off from the body) become condensed upon the walls of the chamber much in the same way as we see sewage sludge deposited in stagnant or sluggish gutters. This fact of the walls of dwelling rooms becoming filthified and offensive to the senses is the explanation of the mud washings and lime washings which the occupants from time to time bestow upon these walls. The custom is a very salutary one, and should be practised more frequently and regularly than it is. But of itself the measure is merely palliative, and does not suffice to remedy the evil under consideration. The proper remedy for pent up and obstructed air is the provision of free passages for its exit on the side opposite to its entry. Provision of this kind should be made in every inhabited room of every house, either in the shape of a door or window, or skylight, or ventilator. As the air of unventilated rooms

becomes filthified by the exhalations from the bodies of its occupants, so does that of unventilated courts and crowded quarters from the decaying matters and filth particles on their floors and surfaces, though probably to a less extent in ordinary times. In both cases, however, obstruction to the free flow of air currents is the cause of stagnation of the atmosphere and accumulation in it of filth vapours rising from the floors and surfaces over and about which it hangs. The remedy for this too is the provision of free passages for the movement of the air so that it may circulate without the obstruction of high walls and blind alleys.

If the municipality will give this subject the attention that its importance demands, there is no doubt that they will be able without much difficulty to concert and carry out a system of house and mohalla ventilation which will vastly improve the sanitary condition of their city, and to a great extent save their people in the future from the miseries they have endured, and loss they have suffered in the pestilent and filth laden atmosphere of their dwellings during the severe visitation of epidemic fevers which have prevailed after the floods of this year and 1876. Were the blind alleys opened out and the crowded blocks of mohalla tenements crossed by airy streets, the foul air which has clung about these quarters for want of exit would have long since been dissipated and replaced by fresh currents. I was much struck by the frequent repetitions I heard of the unwholesome air of this place since the flood came over it. Many different people used almost the same terms in describing its character. It was heavy, moist, depressing and enervating. I myself, on first arrival, observed much the same characters, but they seemed to wear away somewhat either by habitude or actual amelioration of the climate during the six days of my stay.

Latrines.

There are 20 public latrines round about the city, and eight of them are for females. They are built on the ordinary plan, are roofless and ill provided with utensils. The floors in most of them are more or less thoroughly saturated with excreta, and in their present condition it is almost impossible to keep them in a wholesome state. Major Beadon, the Deputy Commissioner, has devised a new form of portable latrine, of which 12 or 15 are now in use. It consists of a wooden frame work four feet square and open above and below, furnished with a bamboo bar fixed on the two sides and projecting fore and aft as a handle for lifting and shifting from place to place. Three sides of the frame are closed in by a braiding of coarse twine, and the fourth is furnished with a hanging screen of sackcloth which is raised as one enters. The frame is 5 feet high, and when in use, a row of six or more of them is set along the line of a trench dug in some field on the outskirts of the city, and the whole row is moved daily to a fresh trench, the old one being filled in. Each of these latrine closets costs Rs. 10, and Major Beadon informed me that at this price they were less expensive than the cost of annual repairs to the old latrines. They are much preferred by the natives to the old pattern public latrine, and the cultivators are always glad to have them set upon their fields for the sake of the manure. They are certainly a very great improvement upon the other system, and do away with the labor of hand removal and trenching and the service and utensils required for the fixed latrines. They are well worthy of more extended adoption.

The cause of the fever epidemic during 1876 and 1878.

The above particulars will convey a fair idea of the sanitary condition of the place, and coupled with the effects of climatic agencies, in some degree account for the excessive sickness and mortality of the present season. The people attribute the excessive sickness of this and the preceding fever epidemic of 1876 to obstruction of the surface drainage of the country caused by the railway embankment running across the line of its flow, and to this only. The natural drainage of the country here is from north to south along the line of the Beyne river, and doubtless it has been seriously obstructed by the trunk road and railway, but I am not satisfied that these alone have been the prime exciting cause of the great fever epidemics which have visited this locality during and after the flood seasons of 1876 and this year.

In 1876 the local monsoon rain-fall was 18·4 inches, in 1877, 16·2, and 35·0 inches this year This rain mostly lodges in the depressions and hollows round about the city. In the year preceding the first, and in the last of these three years the site was also flooded by surface waters from the country to the northward, and to a much greater extent in the last than in the year 1875. Again the first year of the three was a remarkably unhealthy one, and a cholera year with an excessively wet and severe monsoon; the second was an unusually healthy year with a very dry and mild monsoon; whilst the third has been so far a more than ordinarily unhealthy year with a wet and somewhat severe monsoon, and widespread epidemic fevers. In the case of Jullundur, with a smaller rain-fall and no outside (though slight local) flood, in 1876 the total mortality from July to October inclusive was 4,506 against 2,940 in the same period of this year, in which there has been nearly double the rain-fall and a greater flood than that of 1875, whilst in 1877 with a local monsoon rain-fall nearly equal to that of the preceding year and no outside flood, but with a generally mild monsoon, the mortality was only 384. The difference in the monsoon seasons of 1876 and 1878 is not well ascertained, but it appears to me that the first was a much severer one owing to the prevalence of some meteorological conditions, such as heat, moisture, and mugginess of the air, which do not appear to have obtained to the same extent this year.

Whatever the influences of climatic changes may be upon the public health, there can be no doubt they are largely affected by the sanitary conditions of life and locality, and the more perfect these are the better will such changes and influences be withstood. Dress, food and shelter claim attention in the first category, and drainage, ventilation and conservancy in the other. How far the

latter are neglected in this city will have been gathered from the preceding pages. The magnitude and importance of the duty before the municipal committee requires their most weighty and serious attention. The interior of the city requires ventilation. Its sewage requires an outlet more distant than the ponds outside the walls which are at present its main receptacles. The whole site of the town requires deep drainage to relieve it of its water-logged condition, and probably this could be effected by a cutting across country to the Beyne channel.

As to the measures dependent on the people themselves, education, guidance and individual exertion are necessary before they can be brought into practice with any hope of success. In my inspection report of this city submitted in October 1876, I said: "The people generally, all over the city presented a very sickly, unwholesome appearance. Examining those we found in the streets, the shops, and the doorways, the greater number were found to have enlarged spleen either distinctly perceptible to the sight or easily felt on manipulation, whilst almostall were in a more or less anæmic condition with chlorotic complexions, pale, bloodless gums and lips, and blanched finger nails. Occasionally there was a jaundiced tinge of the eyes, and the hands were generally cold to the touch; finally numbers were found moving about with the hot stage of fever actually on them." The same words precisely describe the present health condition of the people. I saw more than a hundred fever patients in different localities, and with the exception of two in the Jail and one in Basti Shekh in the southern suburbs which bore a resemblance to typhoid or low continued fever, nowhere found anything but ague in different forms of severity. The great majority of those I saw were altogether under-clad, and many wore nothing but a loin clout and a thin cotton sheet of loose texture wrapped about the body as a sash, In several cases this was the result of poverty, but not nearly generally so. Yet almost all complained of the cold at night and the distress they suffered from it. The whole population is fever-stricken, but the mortality is mainly amongst the old and feeble and very young of all classes, and the poor of all ages. In the case of the last named many have succumbed to the disease for want of food and proper shelter, for when ill, they could not earn their daily bread, and had not the means of obtaining any care or nursing in their helplessness. To mitigate the sufferings and alleviate the wants of this needy class of the community, the municipal committee voted a sum of Rs. 1,000, and a further sum of Rs. 425 was raised by private subscription amongst the civil officers and some of the native gentry, for the purpose of providing the poor with warm clothing. Besides these aids, Rs. 200 were collected by private subscriptions and nearly an equal amount added thereto by the municipal committee, and the fund has been distributed amongst destitute persons to enable them to reconstruct their houses washed down by the floods. The Deputy Commissioner has organised and supervises a system of relief which has done great good. Five Native Doctors have been employed to treat the sick at their own homes, and they daily itinerate the town and suburbs, which have been for the purpose divided into circles each under the direct supervision of some members of the municipal committee and some Government officials, who visit their charges daily and distribute food tickets as recommended by the Native Doctors. A charitable *modikhana* has been opened in each circle, and here food is delivered free on presentation of a ticket or note from the supervising member. Major Beadon is assisted in the supervision of these relief arrangements by two native Extra Assistant Commissioners. The measure has done great good, but is much restricted in scope for want of funds. A grant of Rs. 2,000 or so from the district funds, I believe, would be sufficient to enable the poor to tide over the rest of the sickly season, and might with advantage be so disposed of.

Some very good limits on Sanitary matters and personal hygiene were written by Assistant Gurgeon Chetan Shah Rai Bahadur and distributed among the people at the height of the epidemic, and no doubt they did much good.

LUDHIANA.

Inspected 5th to 8th November, inclusive.

Chief features of town.

The town of Ludhiána stands on a spit of land formed by a sharp bend of a former bed of the river Sutlej which now flows under the fort of Phillour, seven or eight miles to the westward. This spit of land projects to the northward, and is surrounded on three sides by the low land of the former river channel; whilst to the southward, in which direction are situated the Civil Station, Camp ground, Jail and Government offices, it slopes upwards into the general expanse of the plain. The hollow of the former river bed in the vicinity of the town is more or less entirely covered with cultivation, although on the north-west and west sides of the town it is occupied by an extensive marsh which is permanent. In the monsoon season this channel becomes flooded by the surface drainage of the country to the northward and by overflows from the river Sutlej, from the present course of which it diverges at a point some 35 miles or more to the north-east of the town. The flooded condition of the hollow lasts two or three months, and finally subsides with the stream of the river, into which it empties at a point some eight or ten miles below Phillour.

The town is an open one, and has grown to its present size and importance since the British conquest, previous to which it is said to have been an insignificant village. Its population is 40,385, *viz.*, males 22,350 and females 18,035 (census of 1875 and inclusive of the suburbs which were incorporated with the town in February 1878). The number of dwelling houses is 10,782, and of shops 2,198, and there are 3 public Seráis. The bazárs and streets are generally straight, wide and airy, and are almost everywhere paved with bricks or metalled with *kankar*. The houses are for the most part built of brick, and many of them are commodious and substantial structures.

Defective street drainage.

No single street of the town, so far as I saw—and I went over the greater part of it—is properly drained, and many of them have no drains at all. In those which are provided with drains, either in the form of open surface gutters, or covered sewers, these sewage channels are altogether useless on account of faulty construction and defective gradient. The whole system of town drains and sewers is supposed to concentrate in two main outfall sewers, one of which (a small one) discharges into the old river bed on the east of the town, and the other into the same hollow on its south-west side, the last being an open and capacious drain of masonry, which, passing between the town and civil lines, empties into Budda Nallah near the old cantonment bazár, now occupied by a mud hut settlement. But practically it does nothing of the sort. In several parts of the town the side gutters end abruptly in the course of the street, in others where they take the midline of the roadway, they end with the paved part of the road, and discharge their contents there on to the unpaved surface. In other parts again the covered drains emerge upon the surface of the street and send forth their contents along the open gutter in its centre. In other parts again the gradients are so defective that the sewage stagnates, and requires to be swept up hill into other channels with a favouring fall. I saw the sweepers at work in two or three places trying to sweep out this stagnant sewage which flowed back as fast as it was swept up, and caused much unnecessary labour. Owing to the faulty gradients of these drains and gutters the main outfall sewer remained more or less stagnant except when flushed by storm waters, and poisoned the whole air of the place. To remedy this evil, the Deputy Commissioner, Mr. G. E. Wakefield, (who, as I heard on all sides, has effected great improvements in the sanitary condition of the town since his arrival here), has arranged for a regular flushing of the drain by daily working a well into it for several hours, and at the same time lessening the amount of sewage flowing into it by relieving the street drains of much of their sewage by hand removal in *ghurrahs* of the contents of house sinks and stagnant gutters.

Of the benefit of the flushing arrangement there is no doubt, for the great outfall drain is now entirely free from sewage sludge and sediment and all offensive odours, and is as clean as any sewer drain could be. Of the hand removal arrangement I can say nothing but in condemnation. The municipality has provided no agency or means for its efficient performance, nor have they appointed sites for the disposal of the sewage thus removed. It is supposed that the sweepers carry out this liquid sewage, and throw it on to the fields around the town. But the fact is that they as a rule empty the sewage on to the roadways and bye-ways whenever they really do remove it at all. I found the drains and gutters of the town everywhere in a most unsatisfactory condition, and in several places in a hopelessly filthy condition, and in many places the street roadways were very far from as clean and tidy as they should and might be. The main bazárs and public thoroughfares were well swept and carefully attended to, but not so the side streets. In these I found up to 10 A.M. heaps of house sweepings and night soil deposited at intervals along the roadway, and here and there the sides of the surface drains were dotted with masses of their soft sewage sludge preparatory to removal in baskets to the fields outside the town. The Conservancy Inspector informed me that these unsightly heaps would be all removed by twelve o'clock noon. But in the meantime, during the most active time of street traffic, they were being dispersed and trodden under foot by passing foot passengers and cattle.

Conservancy establishment.

The present conservancy establishment is altogether unequal to the task of keeping the place, considering the size of the town and the unusual difficulties to be overcome from defective sewerage, decently clean and wholesome, and alone is sufficient explanation of the shortcomings above pointed out. The proper remedy of the evils of the present faulty sewerage system is a thorough recasting of the whole on a new and comprehensive plan to concentrate in the present outfall sewer which flows along the south side of the town, and the matter is one which requires the immediate and serious consideration of the municipality. In the meantime, and until such scheme be elaborated and brought into use, the present underhanded establishment should be raised to an efficient working strength, and its duties be extended into the mohalla quarters of the town which under the existing arrangement are left to the charge of independent sweepers, who are very little under control or supervision. At present the sweepers have to do everything by hand labour at a great loss of time and very inferior work. I would recommend that the number of sweepers be raised to 100, and that they be provided with 12 rubbish carts and six sewage carts for the service of the whole town, and that the manure and foul material (for brick kilns) removed by them be stored in walled enclosures on the surface at suitably selected sites round the town, and at those sold for the benefit of the municipality. If this stuff were properly husbanded, I believe the sum realized by its sale would more than defray the expenses of the proposed increase to the conservancy establishment, and very materially improve the sanitary condition of the town so far as concerns the surface filth of its streets and drains. There is a great demand for manure here for the cultivation on the low land about the town, and the municipality has already realized Rs. 325, and Rs. 275 more it is expected will be realized by the end of the year, and this at the rate of one anna per cart-load and 3 pies per donkey-load removed by the cultivators themselves. Were this stuff stored and economized in enclosed sites as suggested, the rates might be doubled, and the gross income from its systematic sale more than quadrupled.

Where the main outfall sewer empties into the Budda Nallah, it forms a considerable pool of liquid sewage. On the edges of this pool I found several poised beam buckets *(dekli)* fixed over half wells cut in the bank, and saw the cultivators at work with them baling out the sewage on to their fields around. This practice might perhaps be largely extended so as to utilize all the town sewage on the surface of the fields before it reached the permanent marsh tract into which the bulk

of it now flows. This is a point of the first importance, and if practicable, should be at once carried out, because the marsh water and the town well water are both on one and the same level, and apparently are one and the same stratum, the level of the well water in flood seasons rising with that of the marsh land on the drainage hollow.

Apart from the true remedy for the filthy state of this town, (a new and comprehensive system of drains and gutters in connection with the existing outfall sewer) there is a great deal to be done towards improving the surface conservancy of its street and alleys, and this can only be done by a properly organized and very carefully supervised scavenging establishment. I noticed in many parts of the town that the shop-keepers encroached upon the roadway by building out little ledges and counters in the line of the street gutters in front of their shops. This stealthy practice should be strictly prohibited by the municipality, and all offenders obstructing drains by such encroachments be made an example of as a warning to others.

The budget sheet of the municipality for the current year shows an opening balance of Rs. 34,200, and an income of Rs. 38,000, total Rs. 72,000, and a gross expenditure of Rs. 50,000. The amount allotted to conservancy establishment is only Rs. 4,480.

Latrines.

There are 10 public latrines at different spots on the town skirts, 5 for men and 5 for women, and I understand that they are all built on the same plan. I inspected the one for men which is situated opposite the fort. It stands close to the walls of the town houses here and on the edge of the bank over-looking the low ground which sweeps round the north side of the town. It is a mere mud wall enclosure, divided off into compartments by matting screens. The walls were only three feet high, and in a tumble-down state, and the mat screens were in a tattered and worn state. The floors were plentifully strewed with fresh sand, and unglazed pottery vessels were set in the midst of each compartment. The place looked remarkably clean, and was free from stinks. The raw earth of the floors, however, was saturated with excreta, which formed a trodden-down crust that raised them several inches above the surface of the enclosure. The place is utterly unfitted for use as a public latrine, and should be demolished, and the site ploughed over, and the earth removed as manure to the fields. The Deputy Commissioner informed me that he had condemned these latrines, and was arranging to introduce portable ones on the plan of those devised by Major Beadon, at Jullundur. I shall be glad to hear that this is done, for nothing could be worse than the public latrines now in use here. The soil of these latrines is disposed of direct in the fields around. There are no fixed sites for its deposit or storage. Such sites—enclosed sites,—should be provided for this stuff and town refuse, and the sites so selected should be on high ground, and not in the hollow of the old river bed.

Slaughter yards.

There are three slaughter yards here, two for horned beasts and one for goats and sheep. The former are situated on opposite sides of the town, and are in a most unsatisfactory state in every way, that on the east side is well removed away from the town, but that on the west side is in the midst of a populous suburb of mud huts on the site of the old cantonment bazár. The floor on which the cattle are slaughtered is a brick pavement which was once coated with lime cement. This, however, has long since disappeared, and the floor is grimed and sodden with blood and gore, and emits a sickening odour. This floor drains into a long gutter which ends in a cup sunk 2 ½ feet in the ground. The mortar cement of both gutter and cup is much worn, and in an impossible state so far as proper cleaning is concerned The contents of the cup are baled out into *ghurrahs*, and carried away to the fields around, but the state of the road adjoining proves that much of it flows from the floor on to the roadway. Immediately at one side of the slaughtering floor are the butchers' shambles where the meat is exposed for sale. They are ranged in three rows on as many sides of a square less than 15 paces across. Each row consists of a mud-built counter or platform surrounded by a thatched roof supported on pole props, and well ventilated by an open frontage and spacious air holes on the rear wall, which is of mats. I found the whole place in a tumble-down state, and the mud work of the counters much worn away and more or less stained with blood. The number of cattle daily slaughtered at each of these places ranges from 4 to 16. The one on the east side should be rebuilt (if the site is the most convenient for the whole town) on a new plan such as that of the Delhi slaughter yards, and the other should be demolished altogether. It is a dangerous nuisance in the midst of a populous suburb.

The slaughter yard for goats and sheep is on the north side of the town in the spacious court of an old native mansion. I found it in very good order and apparently of recent construction. The lime cement on the flooring was frayed in a few spots. These should be repaired, otherwise the decay will spread, and the floor be soon in the state of that of the slaughter yard above described. The blood and offals of these slaughter yards is thrown on the waste ground around or in fields, and is mostly disposed of by carrion feeders. It should be stored as a manure material with the town filth.

Water-supply.

The water-supply of the town is from wells, of which there are 244 inside the town and 8 close outside it. The depth of the wells outside the town to the southward is from 34 to 39 feet from top to bottom, and the depth of the water in them from 8 to 10 feet. All these wells have masonry tubes, and most of them are furnished with parapets and platforms and cisterns which rise from 1½ to 3 feet above the surface. In several of the wells I found the cisterns and gutters in a very foul state for want of regular cleaning. They should be all put into proper order, lime washed and periodically cleansed and flushed. The attention of the conservancy inspector should be called to these points, and he should be held responsible for neglect of them.

The water in the wells, in the cultivated hollow of the old river bed, is only a foot or two below the surface, and the difference between the depth of water level from the surface in these wells and those in the town represents the rise of the town land above the cultivated hollow. In the fort there is a well, the water level of which is apparently higher than that of the town wells and wells of the hollow, though its situation is on the edge of the drop from the high to the low ground. I say apparently, because this was the result of my rough measurement of this well. It would be well to ascertain the facts by careful levelling. The water of this well is very brackish, and that of the one in the adjoining hollow is used by the troops in preference to it. The water in the town wells rises from 2 to 3 feet in the rainy season. This year, the Deputy Commissioner informs me, it rose to a greater height though the exact height is not known, no measure having been taken at the time. The water of the town and suburbs varies in quality in different wells, and some, which from the facts of their surroundings one would suppose to be the most unwholesome, are considered by the natives to be of the best quality. One of these situated at the side of the main outfall sewer near where it empties into the Budda Nallah has its water on the same level as the sewer, and the pool of sewage into which it discharges is only some 30 or 40 yards off in a loose sandy soil. The well is much drawn on by the people of the adjoining suburb, as its water is considered sweeter than that of the other wells of the vicinity, and is better for cooking purposes. This well should be closed as from its position it cannot escape sewage pollution. On the whole, the water here generally is considered to be bad and provocative of bowel complaints. The monsoon floods of the Budda Nallah were higher this year than usual, and the water in the wells of the town, as before stated, was observed to rise much higher than the usual flood level of ordinary seasons. The subsidence of the flood was followed by a severe epidemic of malarious fever which has prostrated the whole population and caused a heavy mortality amongst them. The fever is a severe kind of ague which in many cases has been observed to commence with more or less violent vomiting and purging. The latter symptom continues to be a prominent feature, and frequently assumes the form of dysentery under which the patient succumbs. The people attribute this frequency of bowel complaints in connection with the ague and fever *malaise* to the free indulgence in maize cobs (bhutta) which constitutes a principal food of the poorer classes at this season of the year, and no doubt they assist the deleterious action of the bad well water. In the Jail I understand the fever cases suffer from constipation instead of too free action, and here there are no maize cobs obtainable.

Coming to this town straight from Jullundur where there is a similar and equally fatal epidemic of fever, I was much struck by the difference in the look of the people. There nearly the entire population is ague stricken, and anæmic and down spirited. Here they are equally ague stricken, but they did not seem to me to be so generally anæmic, nor so low spirited. I noticed a much greater activity and life here in the streets and bazárs than I did at Jullundur. The air here also struck me as lighter and fresher than at Jullundur. The difference in the circumstances of the two places also is notable. At Jullundur the site of the town is nearly level, and the surface is studded with pools and wide sheets of stagnant water, and the subsoil is water-logged to some extent. Here the site of the town stands high and dry on the edge of a wide hollow, which on the west side of the town is occupied by an extensive tract of marsh land through the midst of which, flanked by cultivated patches on each side, flows a steady rivulet. Again the town of Jullundur is crowded, ill ventilated and sewage sodden, whilst this town is open, well ventilated and compared with the other to some extent free from the last evil or at all events very much less sewage sodden. I observed however that the surroundings of Ludhiána are very much over grown with trees and hedges of *sirki* grass, especially in the Shahzádpur suburb and parts of the civil station, which must obstruct the free access of outside air. Mr. Wakefield informed me that the lopping of the road avenues had been put in hand, and that it was his intention to have the *sirki* hedges close to the town cut down. This will be a great improvement when carried out. The tree lopping should be carried up to a height of at least ten or twelve feet to be of any utility.

AMRITSAR.

12th to 14th November.

Chief features of the town.

The city is not an ancient one, and is said to have risen to importance only during the last two centuries in consequence of its being the sacred city of the Sikhs and the chief centre of the trade of the Province with the countries of Central Asia to the west and north.

The interior of the city lies very flat, and presents some extensive saucer hollows within the walls, and though its area as a whole is slightly raised above the surrounding ground, the site itself is depressed and situated in the hollow of the natural surface drainage line of the country which is towards the south.

The city is enclosed within a regular wall of bricks, and has 13 gates. Near each of these gates is a line of Police barracks built against the city wall. They are commodious, clean, and well ventilated buildings, and open upon good metalled roadways, either intramural or extramural.

The circuit of the city walls is about 5 miles, and the area enclosed by them about 900 acres, giving an average population per acre of about 151 souls. The walls are high, and the gates lofty and capacious, and they are belted on each side by a wide metalled carriage roadway, that on the inside being incomplete. This arrangement to some extent diminishes the obstruction to ventilation caused by the walls, and when the intramural circular road is completed, the objection on this score will be reduced to a minimum.

The elevation of the city site is about 770 feet above the sea, and the surface soil is stiff impermeable clay to a depth of about 5 feet. Below this is a deep bed of sand which contains successive thin layers of clay interspersed with beds of *kankar* or nodular lime. Surrounding the city, at a distance of about a hundred paces and beyond the line of its extramural circular road, is an interrupted belt of ditch of very irregular shape, width and depth. At the time of my visit this great ditch contained a succession of pools, and several of them very considerable superficial extent. Those on the east and south sides of the city are the receptacles of the sewage of the whole of the intramural area in those directions, and are merely vast sheets of liquid sewage, stagnant and festering and loading the air with their noisome exhalations. The Municipal Secretary informed me that the drainage project for this city which was now waiting the sanction of Government to be put in hand, fully provided for the removal of this serious evil, and he showed me the line of outfall sewer through which it was proposed to carry off the sewage which now accumulates in these cesspools. The new drain is to follow the line of the city wall as does that on the west side and to join it at the south-west corner of the city. Beyond this point the united streams flow in a single channel of ample capacity for both sewage and storm waters to a low piece of waste ground, some 7 or 8 miles away from the city. At a point four or five hundred yards beyond the junction of the east and west outfall drains, and at a spot nearly opposite the main extramural manure store, it is proposed to have a couple of settling tanks for ultimate use whilst one or other is being cleansed, the sediment being disposed of at the manure store. Beyond these settling tanks the clear sewage is to flow in a special canal cutting from which cultivators will be allowed to help themselves on payment to the municipality by means of *jhalar* wells. The proposed arrangement seems well suited to the wants of the place, and promises to be a successful experiment for the introduction of sewage irrigation amongst the people of this country.

Population and No. of houses, &c,.

The population of Amritsar is 142,381 (census 1876), *viz*, males 82,935, and females 59,446 Hindu and Musulman in nearly equal numbers. The number of houses is 43,931, of shops 8,518, and of public seráis 15. There are 3 public gardens and 8 other open spaces free to the public within the intramural area.

Wells.

The number of wells inside the walls is 1,076 and outside 80. The average depth of the former is 42 feet 9 inches with a depth of water of 19 feet 9 inches, and a parapet 3 feet high. Of the latter the average depth is 37 feet 9 inches including 23 feet 6 inches of water, and 3 feet height of parapet. The water in these wells has not been analysed since December 1869. I would recommend that the water of the principal wells be again analysed in order to determine its present quality, and as a datum for comparison with the effects produced upon it hereafter by the new drainage works which it is proposed now to carry out. By the natives the water is liked and considered of good quality. Its depth in the wells is said to rise about 2 feet during the ordinary monsoon season, and it is also said to have permanently risen to the extent of about 6 feet. Since the opening of canals in this part of the country I am informed by some cultivators that the water in their irrigation wells has doubled in quantity in the last 8 or 10 years, that is to say they formerly required 200 "*tinds*" or cups for their water wheels, whereas now they only require half the number.

I found the wells in the city generally well provided with cisterns and spill conduits in connection with the parapets, but in many instances they were in a foul state from the accumulation of ooze and sludge about the masonry work. This is the result of neglect on the part of the conservancy establishment, and the evil should not be allowed to continue.

Public tanks and canal streams.

There are 14 public tanks within municipal limits. In the principal tanks of the city and suburbs, which I saw, the water was generally clear and bright under a thick scum of green vegetation. This latter is periodically removed, and carried away with the town sweepings &c. The water is changed by streams let on from the canal cuts. There are two main and two branch canal streams that flow through the city and furnish water for flushing its drains &c.

Interior drainage and conservancy of the city.

The interior of the city is traversed in all directions by good and metalled or brick paved streets provided with surface gutters along the sides. Owing to the level surface there is very little fall on these gutters, but I found them almost everywhere in an exemplary state of cleanliness, and free from smell and the sewage sludge that are found in most native towns. Most of these gutters join large out-fall drains which discharge on the east and south sides into the great cesspools already mentioned, and on the west side and part of the south side into the two great out-fall sewers which meet outside the south-west corner of the city walls. But the sewage carried by some of these gutters in a central portion of the city where the level is depressed, finds no exit from the city. The sewage of this portion of the intramural area is received into a square tank excavated in the soil of a garden which is surrounded on all sides by densely populated quarters, and it there stagnates and evaporates, and festers, and soaks into the earth. This is a most dangerous and pestiferous evil, and should be without delay removed. I found the tank and its vicinity in a most horribly offensive state, and am surprised that it has so long been allowed to remain. The Secretary informed me that there was a project under the consideration of the Municipal Committee for providing a free outlet for the sewage of this quarter by means of an aqueduct across the garden, so as to connect it with the system of street drains, and he showed me the plans of the proposed aqueduct by which the sewage could be so disposed of. No time should be lost in putting this work in hand, for at present the collection of sewage in this garden is a very serious nuisance and danger to the locality, whilst in the overflows of the monsoon season it covers the whole surface of the garden with a wide sheet of putrefaction.

In the course of my tour through the city, I saw several mohullas in which the new system of roadways and surface drains had not yet been laid down, and in others I found the work of renovation in progress. The Municipal Secretary informed me that about two miles of new drains were laid down yearly, and about four miles of old drains were repaired yearly. There are now comparatively few parts of the city left to be repaved and drained so far as the public streets and passages are concerned. There is much, however, yet to be done as regards private enclosures and courts. In several of these I found that the only representative of a drain was a tortuous groove in the surface of the soil. These grooves were everywhere silted up more or less completely by black, stinking sewage sludge, and not unfrequently stopped short of the street gutter. In many instances these offensive and inefficient sewage carriers were open to the public street, and might consequently be fairly denounced as a public nuisance. In such instances the owners or occupiers of the premises should be called upon to put them into a wholesome and efficient state, and connect them with the nearest street drain. I observed also that in several parts of the city the parachute gutters of houses fronting on the public streets were in a very filthy state from long neglected encrustations of sewage sludge. This is evidently the result of neglect and carelessness on the part of the scavenger overseers, and admits of immediate and easy remedy. As at Delhi so here there are public dust bins in the streets at different parts of the city. Those here, however, are fixtures on the plan of those in use at Bombay. They are raised on short wood pedestals, and are open above and at one end. I think the Delhi pattern dust bin is far superior to these, and worthy of adoption here as these become worn out.

On the whole I found the interior drainage and conservancy of the city, with the exceptions mentioned, in a very satisfactory state, and considering the area of the city, highly creditable to the able and energetic supervision of the Municipal Secretary. As before mentioned the great evil in the sewage system of this city is the discharge of a very considerable portion of its sewage into the great hollows upon its east and south sides.

A similar evil, on a smaller scale, is the sewage tank in the Akáli Katra garden which has been before mentioned, and which it is proposed to remedy by means of an aqueduct led across the garden. This work should be carried out without further delay.

Conservancy establishment.

The conservancy of this city is amply provided for by an efficient establishment, and is very well carried out. The organization and operation of this establishment is more complete and successful than that of any of the other towns of the Province. The scavenging of the public streets and private mohalla quarters is efficiently carried out, and the refuse and filth of all kinds removed to two or three fixed sites where it is stored as manure and sold by the municipality. The average annual sum derived from the sale of the city street sweepings and night soil is Rs. 25,000. The municipality has monopolized the whole of the refuse matter and filth of the city, and brought the conservancy of all parts of the area under its own direct control; and with the happiest results both as regards the cleanliness of the streets and courts and the profit of the business. The Secretary has drawn up a set of rules for the guidance of the conservancy establishment of this city, which I think might with great advantage be adopted by all other municipalities in the province with such modifications as the circumstances of each may necessitate.

Public latrines.

There are 13 public latrines round about at convenient distances outside the city walls, and a portion of each is set apart for the use of females. Twelve of these latrines are mud built, and provided with roofs supported on short props to admit of free ventilation. Each of them consists of two or more rows of compartments under a single roof for each row, and they possess all the requirements, so far as the mere plan is concerned, of a wholesome and comfortable latrine, but they have been deprived of much of their utility by the neglect to furnish the compartments with proper utensils. In some I found that there were no utensils at all, whilst in others those in use were the common vessels of porous red pottery. The floors too were generally unpaved and uncemented, and as a consequence the soil is saturated and encrusted with excreta, the stench from which pervades the whole building and taints the air of the vicinity. The other latrine is one that has been recently built on a new plan devised by the Secretary. It is a circular enclosure covered on the outside by a ramp of turf, and contains two or three trees in the centre of its area, to which there are passages for entry and exit on opposite sides of the circular ramp. Along the inner side of the ramp wall runs a roadway for cleaning the latrine compartments through arched openings in their rear walls, the rows of compartments themselves with their screen walls forming an inner circle round the central area. In the centre of the area is a square hut for the storage of dry earth and the shelter of the sweepers in charge. The whole structure is of brick masonry and the floors are of lime cement, as also are the seats in each compartment. I found the latrine in a remarkably clean state and perfectly free from smell. In fact it is the cleanest and nicest looking latrine I have anywhere seen. I saw it, however, under exceptionally favorable circumstances as to weather, and noticed the following defects in it as a public latrine. The whole circle of compartments is roofless; this defect must in wet weather completely nullify the dry earth system, whilst in hot weather it must render the place insupportably trying by reason of the glare and radiation of the sun's rays from the chunam cement of the floors and walls. Were a light roof, set upon prop pillars so as to admit of free ventilation, provided, these defects would be removed. The utensils of the whole latrine are of porous red pottery-ware; this sort of material is altogether unsuited for use in a latrine, and should be rigidly proscribed; from their porous nature it is impossible to keep them clean and free from stench, whilst from their fragility they prove not only an unnecessary expense

but a very worthless utensil. These evils can be at once remedied by the use of glazed pottery or stone-ware. Another defect I noticed was the absence of any suitable instrument in the hands of the sweeper for removing soiled portions of the dry earth spread upon the floors, whilst the layer of this dry earth was itself generally much too thin for any practical utility. The object of the dry earth on the floors is to catch and absorb excreta that escape the utensils, and for this purpose the layer should be 2 or 3 inches thick at least. Then for the removal of such drippings, which in most instances cake upon the surface of the loose earth, the sweeper should be provided with a small iron shovel or scoop with which to raise soiled portion of earth from the floor, (replacing the portion so removed with fresh earth) and not be allowed to scrape it clumsily along the floor to the basket in which he removes it as he now does with an ox rib, omitting altogether to replace the earth thus removed with a fresh supply. It is the neglect of attention to these small but very imperative details which has almost everywhere converted public latrines, otherwise suitable conveniences, into intolerable nuisances.

Cremation grounds.

There are two Hindu cremation grounds, on the east and west sides of the city respectively. The former is in some fields at some distance away. The other is close beyond the circular road, and is enclosed within walls. I found it in very good order, and only requiring an ash-pit to complete its utility. Such a pit might be built in at one corner, so as to keep the main area free from scattered ashes.

Poor-house.

There is a poor-house in the city for the accommodation of the blind, lame, and aged. It is supported by the municipality at an average annual expenditure of Rs. 1,200, and has a monthly average of 50 inmates. I found the place in good order, and the inmates comfortably provided for. I also visited the temporary poor-house provided for the Kashmir famine refugees. The sanitary arrangements of the place were satisfactory, but the shelter of the open verandahs in which the inmates were accommodated was insufficient in this cold weather. The Secretary informed me that each of the inmates was to be at once provided with a blanket or other warm clothing.

Address to the native members of the Municipal Committee.

I closed my inspection of this city with an address to the native members of the Municipal Committee; some 12 or 14 of whom did me the honor to meet me at their town Hall. Mr. C. R. Hawkins, the Deputy Commissioner being so good as to introduce me to them individually. Whilst acknowledging their zeal and enterprise as exemplified in the improvements effected in this city during recent years, I pointed out to these gentlemen certain defects and shortcomings which I had observed in the sanitary condition and conservancy system of their city; defects which though small matters by themselves were nevertheless like the keystone of an arch, as the prime factor in the stability of the structure, the very points on which depended the utility, convenience, or wholesomeness of the whole. Of such nature were the absence of provision for ventilation in private dwellings, the want of proper furniture and arrangement in their public latrines and urinals, the objectionable custom of men and cattle herding under the same roof, &c. I also brought to their notice the fact disclosed by the small-pox mortality in this city during the epidemic of the past spring and summer, *viz.*, the unprotected state of the population notwithstanding that they maintained an establishment of vaccinators. On this subject a discussion followed, and the gentlemen present were unanimous in the opinion that vaccination, although readily accepted and fully credited by the bulk of their educated fellow-citizens, had no chance of making way amongst the poor, ignorant, and improvident classes, until the municipality revised their bye-laws and added a clause which would empower them to enforce the measure as a protection to the community at large. There would then be no difficulty in effecting a thorough vaccination of the whole city. The measure is a very important one, and the power of enforcing it if entrusted to the Municipal Committee would, I feel certain, not be abused in the hands of the intelligent members now composing it. Another subject which occupied the attention of the municipal committee, and was referred to me by several of the members, was the new project for the drainage of the eastern and southern quarters of the city, and the abolition of the vast cesspools outside the town walls in these directions. The existence of these sinks of sewage so close to the city were felt to be a serious evil; and at times, as in the hot weather, an intolerable nuisance. Plans and estimates of the project were submitted for the sanction of Government more than a year ago, and the municipality has appropriated the necessary funds for the execution of the work, but up to the present time the decision of Government has not been communicated to them. The abolition of these pestiferous pools and the provision of free outlet for the sewage they now receive, is a very pressing necessity, and no time should be lost in putting the work in hand.

GUJRAT.

Inspected 20th December.

Chief features of town.

The town of Gujrat has a population of 17,391 (census of 1875), and contains 3,948 dwelling houses, 924 shops, and 1 public serai. It is an open town standing in the midst of a wide and gently undulating plain, the surface of which is well cultivated and freely wooded with clusters of timber trees. The natural surface drainage of the country flows from north to south, and is carried past the town in two principal channels, one on the east, the other on the west at no great distance from the town, and ultimately is discharged into the Chenab. The site of the town lies somewhat low with respect to the surrounding country, and is subject to occasional floods in the monsoon season, but the town itself is slightly raised above the level of the ground around and in the centre, which is occupied by the mound of a former fort, rises to the height of 30 or 40 feet. The houses are almost entirely built of baked bricks, and are much crowded together, and set at every sort of angle with each other. The main bazárs and principal streets are straight and well ventilated, but the mohalla

passages and impasses are very narrow and winding, and in them the high walls of the houses entirely obstruct the ventilation. The atmosphere of these quarters is very foul, and I at once noticed the fact on stepping into them from the main street.

Streets and alleys.

The streets and alleys are metalled or brick-paved throughout the town, and are furnished with shallow surface gutters which in the larger streets run at each side, and in the lesser ones down the middle line of the roadway. These gutters are supposed to convey the sewage out of the town by two main outlets, one of which is on the north and the other on the south side ; and in these directions each main drain ends in an open trench which runs along the roadside to the natural drainage gullies before mentioned. I found these trenches more or less choked by silt and rank herbage and grass, and in the town I found the gutters everywhere very shallow, and in many places completely obliterated by street drift and rubbish which had become trodden down to the general level of the roadway. The gutters were very dirty and very rough from unevenly set bricks.

The public streets and bazárs were generally well swept and in a tidy condition, but the dwelling quarters were in a very filthy state, and the air in them perceptibly foul. This is to a very great extent the result of sheer neglect, for in themselves these mohalla alleys and passages generally present unusual facilities for an efficient scavenging. Their roadways are paved and drained, and only require proper sweeping and flushing to keep them in a wholesome state. As it was I found heaps of house sweepings and ordure deposited here and there along the foot of the wall; house sinks and gutters which are never cleaned, oozing out a thick black slush on to the roadway, and now and again came upon cattle tied up in the alley to the obstruction of its passage and filthification of its surface. In the majority of the mohallas this dirty state of things explains the foulness of the air noticed in them, and should not be allowed to continue. In the Báoliwala mohalla, the pavement and gutters were very much worn, and the sewage collected into filthy puddles in pits here and there in the course of the roadway. This mohalla requires to be repaired before it can be properly served by the conservancy establishment.

Conservancy establishment.

The conservancy establishment is without supervision and without control, and consequently does its work in a very careless manner. It requires to be entirely remodelled and put upon a working footing. I understand that it is the intention of the Municipal Committee to appoint the Civil Surgeon, who as health officer of the district is also ex-officio a member of the Committee, president of a Sub-Committee for the organization and supervision of the conservancy of the town. This is a right move, and should not be delayed. I would suggest for the consideration of the Municipal Committee that a more suitable establishment be employed for the town, and that the sweepers and bhistís be divided into gangs for service in different quarters of the town, one sweeper being told off for each public latrine, and the whole of their service to be given to the town. At present they do little in return for the pay they receive from the municipality, which is natural enough considering that the municipality is indifferent to getting its money's worth. The scavenging of the whole town should be taken in hand by the municipality, and the whole of its sweepings and ordure, &c., should be stored in manure godowns (small mud wall enclosures at suitable sites round the town as for instance near the latrines), and sold for the benefit of the municipality. If this is properly carried out, the income derived from this source would go far towards paying the expenses of the conservancy establishment. At present the town sweepings are sold to a contractor at the nominal price of Rs. 80 a year, and he only removes what he can sell as fuel at the brick kilns, and the same is done also by the private sweepers of mohallas, neither the one or the other making any attempt to clean the streets or give any return for the privilege of removing this fuel material, neither the kilns nor the fields can be worked without the aid of the town sweepings, and they are purchasel by the kiln burners and cultivators from sweepers whose only right to it is the understanding that they scavenge the streets in return for its free removal. But this scavenging they never perform, and never will so long as they are left to act independent of all control.

Present system for disposal of sewage very unsatisfactory.

The paved and metalled roadways afford unusual facilities for a quick and easy scavenging, and the slope of the ground in most parts of the town favours the free flow of sewage in the gutters were they not everywhere obstructed by rubbish and earth. There should be no difficulty in putting this town into a decent state of cleanliness, the means are already provided, what is wanted is proper attention and intelligent supervision. I found the streets and alleys, except in the main thoroughfares, everywhere unswept and the gutters without exception neglected, they were neither flushed nor swept as they should be. If the streets and gutters are once taken in hand and put in order, there should be no difficulty in always keeping them so with ordinary attention on the part of the conservancy establishmeut. There are no conservancy carts here. The street sweepings are removed on donkeys and baskets carried on the sweepers heads, a process which seems to suffice for this place as the distances are not great.

Latrines.

There are four public latrines of pakka masonry, they are roofless and in the same state as those so frequently described in the reports of other towns. They require light roofs a shed for storage of dry earth, and glazed ware utensils. If these latter are not provided, the floors should be laid with loose earth 3 or 4 inches deep, and the ordure removed by a shovel "en bloc," and fresh earth laid down in the gap. If this is properly done, there should be no difficulty in keeping these places wholesome (when roofed) and fit for use.

Wells.

There are 90 wells inside the town, and 50 round about outside. Of the former 32 are more or less brackish. The average depth of the wells outside the town is 35, feet. Inside the town it varies according to the ups and downs of the surfaces and in the fort reaches 60 feet. The depth of water in the wells is 15 feet. I found the surroundings of the wells in the town generally filthy and slushy with black sludge, and the cisterns coated with thick deposit of mud. All the result of neglect.

Tanks.

There are 3 or 4 tanks outside the town, two are of pakka masonry and close together on it north side. They are fed from the surface drainage of the country. I found both covered with a scum of green vegetation. In the Sant Rám tank this was bright and fresh, and the water underneath perfectly clear and sparkling. In the other called Bahagmal tank, the scum had withered and broken up, and rendered the water thick and turbid. This scum which seems to have the effect of clarifying the water when fresh, should be skimmed off before it decays, and be finally disposed of at the manure godowns.

JHELUM.

Inspected on 16th and 17th December.

Chief features of the town.

Jhelum is situated on the right bank of the river, and the line of the Punjab Northern State Railway passes close to the south of it. The town is an open one, and has increased greatly during the past 12 or 15 years by the extension of new quarters on its western side. In the old town the houses are mostly of baked bricks and solid masonry ; in the new quarters they are generally of unbaked bricks and mud masonry. The streets are for the most part wide, straight and well ventilated, and from the position of the town and general form of the ground possess unusual facilities for a good and quick drainage. These natural advantages, however, have not been utilized, and I found the town in a far from satisfactory condition in respect to its sanitation and conservancy. The main bazárs and principal streets are either metalled with *kankar* or paved with bricks set on edge, but the greater number are neither paved, nor metalled, nor drained. The paved and metalled streets are provided with surface gutters at each side, but they appear to have been laid down in haphazard sort of fashion, and as I saw them were utterly useless as sewerage carriers. The brick pavements are very roughly set, and their side gutters are mere square channels formed of undressed bricks very unevenly fitted together. Most of these surface gutters are obliterated for a larger or shorter extent of their course by accumulations of street dust and rubbish trodden down to the level of the roadway with the surface of which they are continuous, and in some parts I found the gutters obstructed by the steps of doorways built up in the channel. I nowhere found a gutter free throughout its course, though those of some short streets in the old town were observed to empty into an underground drain which discharges into the river bed.

Sewerage.

The sewerage of this town is supposed to be provided for by these surface gutters and the underground drains into which they conduct. The sewage is disposed of in two opposite directions ; one set of drains discharging into the river bed, and another set into a natural ditch or drainage gully, which runs between the town and the Kala road on the opposite side. This gully winds round the south side of the town, and empties into the river bed between it and the railway line. As I found it this gully presented a long string of sewage puddles connected by thready streams passing from one to the other in a winding course according to the levels of the gully bed. I saw ducks feeding in them, women washing their linen in them ; and on the edge of one I saw a man bathing with water drawn from the pool.

Between the town and the river is a masonry embankment and broad metalled road, and at intervals there are flights of steps down to the river bed. Under this roadway pass the drains which discharge into the river. At this season the river being low, a large surface of the bed is exposed and dry, and across this interval the sewage finds a way to the river channel or to the pools along its margin.

The drains themselves were in a very neglected and foul state, and more or less silted up with sewage deposit and street rubbish. Altogether the sewerage of this town is in a very unsatisfactory state, and requires to be entirely remodelled. Until this can be effected, it is necessary to pay attention to the existing systems of drains and gutters, and utilize them to the best advantage. As it is they are sadly neglected, and the cause of a danger to the town. The street gutters should be cleared of the rubbish that now obliterates their channels for many yards of their extent in all quarters, and the underground drains should be swept clean, and then both drains and gutters should be kept in a wholesome state by regular flushing and systematic service. They could not have fallen into their present state of filth and obstruction had any attention been paid to their service, and this is the more to be regretted as the facilities of the situation are such as few towns possess. With a properly organized and efficiently supervised conservancy establishment there should be no difficulty in keeping these sewage channels in a wholesome state, and utilizing them to the fullest extent. At present their utility is to a great extent marred by neglect.

With the exception of the roadway of the main bazár, and the wider roads on the outskirts of the town, I found the streets everywhere in a very untidy and unswept condition ; with streaks of house sewage and puddles formed by obstructed gutters at frequent intervals. In most streets also were found heaps of ashes, house sweepings and night soil, which up to 1 P.M. had not been removed by the conservancy sweepers, and were being gradually trodden under foot and scattered over the

surface of the roadway. The interiors of private courts, of which I inspected several in each of the different quarters of the town, were everywhere in a very filthy and sloppy condition from sheer neglect. In most of them one corner was walled off as a latrine, and another was used as a scullery. None of the latrines were properly attended to, and the floor of each was saturated with excreta; whilst the corner used as a scullery was soppy and black with muck for want of a channel or outlet, and where such was provided, it was merely a groove on the surface of the earth to let the water out through the doorway or the wall along side into the street, where it either fell into the side gutter, or passed over the stuff obliterating its channel on to the roadway beyond. All these defects are to a great extent remediable by a sensible supervision and working of the conservancy establishment, and are very much attributable to faulty organization and want of any supervision.

The entire conservancy establishment as it exists at present requires to be remodelled, and placed on a proper footing and under a responsible head. It should be told off in batches for the several quarters of the town, and be held responsible for the cleanliness of their several quarters. Sites should be selected and walled off as manure godowns, and all ordure, filth, and town sweepings collected within the municipal limits be stored in them for the benefit of the municipality by sale to cultivators or to brick burners. By the neglect of this simple measure the municipality loses a steady income of several hundreds if not thousands of rupees a year. If properly managed, the sale of this stuff should to a great extent recoup the expenditure in the conservancy establishment.

Public latrines.

There are six publi clatrines round about outside the town. One is of pakka, and the rest are of katcha masonry. I inspected one of the latter. It had been recently fresh plastered, and was generally in a clean state, but the floors were already getting saturated with excreta for want of a sufficiency of dry earth dressing. They are roofless, and the utensils are of porous red pottery. In wet weather these places must be a perfect nuisance.

Water-supply.

The water-supply of the town is from wells and the river. There are 40 wells inside the town and 14 outside. Their average depth is about 24 feet, of which at this season 6 feet is water. The water in the wells regularly rises and falls with the general flood of the river. It is very clear and sparkling and esteemed of good quality. The wells are generally well protected by covering the mouth with a wood platform, and are provided with gutters for spillings. These conduits of several of those in the old town require looking to and daily service. I found the gutters of two of them obstructed by street rubbish and the surroundings in consequence, slushy and foul. On the second day of my inspection I met 6 or 7 of the members of the Municipal Committee at the tahsil, and addressed them on the subject of the conservancy of their town, pointed out the defects I had noticed in it and in their private dwellings, and showed them how easily these were to be remedied by a little attention on their part. I also spoke to them on the subject of vaccination, and gathered that the measure was appreciated and freely accepted by the people of this town. They appeared to me to be fully alive to their own interests, but did not concern themselvs with sanitation or with the disposal of the municipal funds. It appears that most of them are occupied in their own business pursuits, and the interests of the town depend for their advancement on the civil authority of the place, a circumstance which simplifies the expenditure of town money on town improvements if these be seriously taken in hand; whilst at the same time it offers the facility for frittering it away in unnecessary extra mural works—a result which is too often the case with the municipal funds of the lesser municipal towns. There is a great deal to be done to put the conservancy of this town in a proper state, and the subject should be taken up and dealt with at once by remedying the defects above pointed out, *viz.*, cleansing of drains and clearing of obliterated gutters and organization of conservancy establishment.

WAZIRABAD.

23rd and 24th December.

Chief features of town.

The town has a population of 15,346 (census 1875), and contains 4,635 houses, 830 shops and 2 serais. Of the houses 475 and of the shops 265 are unoccupied or in ruins.

The town stands on the left bank of the Palku rivulet, and is surrounded on all sides by excavations and hollows of the surface which form a succession of pools in the rainy season. Close on the west side of the town passes the line of the Northern State Railway. The town was originally enclosed within brick walls, but suburbs have grown up outside them, and they are now only traceable here and there near the main gateways of which there are five with seven or eight lesser ones. The interior of the area is traversed by some five wide streets, which generally run straight at cross angles, and are freely ventilated. The mohallah alleys and impasses branching off from those main streets are very narrow, and in their ultimate ramifications have no ventilation whatever.

Drainage.

Most of the main streets as well as the mohallah alleys are paved with bricks set-on-end, and are drained by a shallow gutter running down the centre of the roadway. These gutters are concentrated into 8 or 10 main channels which pass out through the walls or at the gateways all round the circumference of the town. Those on the west side empty into a big open masonry drain which runs along that side of the town and empties into the Palku stream, those on the south side, discharge on to the roadway in that direction, whilst those on the

east, empty into a natural drainage gully which sweeps round that side of the town into the Palku stream, and those on the north side, empty directly into that stream. These are the several outlets of the natural surface drainage of the town after rains, as well as of its sewage, but this last is not generally sufficient to produce a constant stream in any direction. At the time of my inspection, although a brushing up had been going on during the two preceding days, I found the surface gutters everywhere in a foul and more or less choked condition from collections of sewage silt, and the outlet gratings in the water-way were obstructed by heaps of street drift and sewage muck which had thus accumulated from sheer neglect on the part of the conservancy establishment. In the large out-fall sewer or drain on the west side of the town I found isolated pools of stagnant sewage opposite the inlets of the several town sewers; and this was the consequence of the floor of the main drain being blocked at intervals by loose earth and drift derived from the adjoining roadway. In some parts this loose earth had become saturated with sewage and covered with a strong growth of grass and weeds. Unless this is at once removed, and the drain kept flushed by working a well into it for a few hours daily, the masonry floor of the drain will soon be rotted, and when the monsoon floods come, the current of rain waters will find out these weak points and cut up the channel of the drain, and cause injury which it will take thousands of rupees to repair. This main drain appears to have been only recently completed, and the neglect with which it is treated, threatens not only to destroy its utility, but to waste the money and labour expended on its construction. All that is required to keep this drain in proper order is careful scavenging on the part of the conservancy establishment.

Sewerage.

I found the paved roadways in the main streets generally, and in the great bazár especially, much worn and very uneven from sinkings and fractures of the surface. In the mohallahs the pavements are in much better preservation, but I found them and their gutters in a very filthy state, and utterly neglected as to conservancy. It appears that the scavenging of these densely populated quarters of the town is left to sweepers who contract with cultivators outside the town to keep their lands manured on condition of receiving a half or other agreed upon portion of the crop according to the distance of the land from the town; these sweepers (who are independent of the municipal conservancy establishment), also receive payment monthly, and an allowance of food weekly from the householders of their respective mohallahs on condition of keeping them swept and clean. But they are under no supervision or control, and practically work entirely for their own interests to the neglect of those of the people from whom they derive their living. They merely remove what is of value to themselves, and never trouble themselves to sweep the mohallahs or remove the litter they scatter in the process of taking away the manure stuff they get for nothing. They in fact give no return for removing what to them is a source of livelihood, and this is the natural result of absence of proper supervision, and the culpable indifference of the mohallah householders. Either these sweepers should be brought under the control of the municipality or the removal of the town sweepings from mohallahs should be made over to a contractor who would be held responsible for the proper scavenging of the quarters. In their present condition of filth and neglect these mohallah alleys are a disgrace to the town, and a serious nuisance to its inhabitants generally.

Conservancy establishment.

The conservancy establishment requires remodelling and a strict supervision. Under the existing system their pay, so far as the municipality is concerned, is a mere waste of money. The municipality has appointed no fixed sites for the shooting of town filth, and consequently what is not used up in the kilns and fields is cast on the surface anywhere round about the town.

I would recommend that the municipality take the whole of the town sweepings under their own control. That of the mohallahs might be worked at first through a contractor, and that of the bazárs and public roads and latrines by the municipal conservancy establishment. Adjoining each of the public latrines there should be provided a low mud wall enclosure or manure godown (*khad* godown) for the latrine soil, sewer muck and street sweepings, &c. And from those stores the stuff could be sold by auction or through a contractor.

Public latrines.

There are 4 public latrines, all built of pakka masonry and of uniform pattern. Each forms a compact block with a sweeper's house and enclosed yard for the women's latrine at one end, and a double row of compartments for men projected from the square enclosure for the rest. They are roofless and provided with no utensils of any kind, nor is dry earth used in their service. The floors are the bare earth, and in the men's compartments they are covered by wood or masonry seats. I inspected two of these latrines, on the west and east sides of the town respectively, and found them in a horribly foul state. I observed also that the open ground about them was used as freely as the latrines themselves. They require light roofs, glazed-ware utensils, and dry earth dressing.

Slaughter-house.

Near the latrine on the west side of the town is the slaughter-house for goats and sheep. The yard and roofed slaughter-shed with its paved floor and gutter, were in good order, but immediately outside was a winding trench which received all the blood and washings, &c., of the slaughter floor (the offals are removed in baskets) and discharged it into some shallow pits near the entrance to the yard. This is very objectionable, and in the hot weather must prove an intolerable nuisance. I think a public drain should be laid down from the gutter of the slaughter floor straight across to the outfall drain, which runs only a few score feet from it.

Cremation ground.

About half a mile to the east of the town and on the bank of the Palku stream is the Hindu burning ground. I found it in fair order, and noticed a number of graves of infants in the bank of the stream and close to the water's edge. The bodies had been so superficially buried that in two of the graves the clothes were projecting above the surface. I noticed also several human bones in the water and a skull lying at its edge. The situation of this cemetery and burying ground is extremely ill-chosen and highly objectionable. The site should be condemned at once, and another selected in a more suitable site. The Palku stream flows down from this to the town, and at this season the current is so slow that the water may be considered as almost stagnant,

Opposite the town itself and under the walls of the Sammun Burj, the stream widens considerably, and forms a large marshy pool full of all manner of filth. I saw the rotting limbs of a donkey and numerous bones in the shallow part of the pool close to where a number of women were bathing at a spot opposite Sammun Burj. And from this down to the railway bridge the whole extent of shore is a public latrine. At the bridge itself are the washing slabs of the town washermen, and midway between it and the bathing place above mentioned, is the outfall of the great drain which runs along the west side of the town.

The level of the water in this stream and in the town wells is one and the same, at least in that half of the town next the stream, and the two I am informed rise and fall together. The Palku is flooded yearly in the monsoon season, and remains so for 3 or 4 months by the drainage from the country to the north-eastward. The channel is very winding, and discharges into the Chenab a few miles below the town. The stream I am told has become much less in volume, and almost entirely stagnant during the cold weather since the construction of a dyke some miles above the town in connection with the railway bridge. It is important that the stream should be kept flowing, and this might be facilitated by a cutting or clearing of its channel to the south-west of the town.

Water-supply.

The water-supply of the town is derived from this stream either directly or through the wells fed by it. There are altogether 225 wells inside and 71 outside the town. The average depth of the wells is 25 feet, and of the water in them at this season about 6 feet. In the monsoon season the well water rises 6 or 8 feet. This annual flushing of the Palku stream is the saving of this town in respect to its water-supply, which, but for this change, would soon become intolerably polluted and poisonous The water is supposed by the town people to be improved in quality after every flood. At this time I am informed that it is good only on the south side of the town furthest away from the Palku stream, and that in all the wells in the half of the town adjoining the stream the water is disagreeably flat and mawkish, and if left standing in a vessel overnight becomes covered with a thin oily film. The best well is said to be that close to the pond at the back of the old Dâk Bungalow on the south side of the town. The tank itself is one of the cleanest of its kind that I have seen, considering it is in noway protected from cattle or road drift, &c. Strangers to the town sometimes notice that the water when used for purposes of ablution leaves a greasy feeling on the skin and on clothes or vessels washed in it. I think the municipality should have the water of their town wells analysed, and would recommend that samples be sent to the Chemical Examiner, Lahore, for the purpose. Some from wells furthest and nearest the stream, and from the stream itself, should be tested for comparison.

The peculiar circumstances of the situation of Wazirabad in this stream render the duty of maintaining its conservancy in as perfect a state as possible one of the first importance. In my interview with the members of the Municipal Committee I took the opportunity to explain to them the dangers to themselves and their fellow-townsmen of the neglect of ordinary precautions for cleanliness which I was sorry to find in all parts of their town, and addressed them at length on the importance of their paying attention to this subject and discussing it amongst themselves with the view to making an early arrangement for the re-organization and systematic working of the conservancy establishment and general scavenging of the town. I understood that the members of the Municipal Committee have not hitherto paid much attention to the sanitary condition of their town. I hope this will no longer continue, and I trust the interest these gentlemen professed on the occasion of my interview with them will not be as fleeting as my own visit to them. They have it in their own power to very materially improve the very unsatisfactory condition of their town at little extra cost than that of a little time and trouble. The object is to get rid of the filth and excreta that are now left in their streets and dwelling quarters, and that in the most expeditious and economical manner. I have personally pointed out to them how they can do this by turning to the best advantage the resources of the town and utilizing the establishmnt they pay for the purpose.

MOOLTAN.

Inspected on 27th, 28th, 29th January 1878.

Chief features of town and suburbs.

The town of Mooltan is of very ancient date, and is built on the site of older habitations over the remains of which it runs to the height of from 10 to 20 feet above the general level of the surrounding country. The population of the town and suburbs is 50,875 (census 1875), and the total number of houses 18,500, of which 1,500 are uninhabited. There are besides 1,500 shops, of which 200 are unoccupied. And there are two public serais, *viz*, the Chibil Yak and the Dowlat Darwáza, of these the former is in a decayed state and fast falling into ruin, being now rarely used. The town proper is enclosed within

bastioned walls, and has 9 main gateways. The wall is interrupted in that part of the town opposite the fort, but in the rest of its circuit it has a promenade along the inner side. On the outside there is a wide shallow ditch which completely encircles the town passing right round between it and the fort. Beyond it is the circular road or carriage drive, which runs round between the town walls and the suburbs on three-fourths of the circuit and between the town and fort on the other. The suburbs are very populous, and cover the ground close about the town in all the circuit not occupied by the fort. The surface in and about these suburbs is very uneven, and in the flood season receives lodgments of surface drainage. Most of these hollows are under cultivation. Beyond the suburbs to the north and west are the civil station and military lines. Through the suburbs and civil station pass the two inundation canals of Wali Mahomed Khan and Shahpurwalla. They pass close on opposite sides of the city, and give off innumerable water cuts all over the surrounding area for purposes of irrigation. These canals are full of water from May to October, and remain dry during the rest of the year. The town of Mooltan within the walls presents a densely packed mass of brick houses which are of very small size and run up to 3 or 4 or more stories in height. Their blocks are at all angles to each other, and separated by a ramification of very narrow winding lanes, very few of which are paved or drained. The whole area of the intra-mural town is intersected by two main lines of bazár which cross about its centre, near which is an open space known by the name of "Kup." This was formerly a wide pit in which the filth and refuse of the town used to be cast. It has been recently filled in, and now presents a level surface of dust and brickbats.

Pavement of bazár road.

The main bazárs are remarkably well paved with bricks, and are well ventilated thoroughfares. The Husain Agha bazár especially is a very fine street, the widest and best kept in the whole town. These bazár roadways are paved on the "fish back" plan, and provided with open surface gutters at each side. I found them in a clean and tidy condition as regards the roadways, but the side gutters were in a very neglected state, and more or less coated with sewage silt from want of proper sweeping and flushing. In several spots I observed they were obstructed by the heaps of merchandise of the shops, and in one place I found a journeyman cobbler settled in the gutter with his tools and assortments of old shoes, &c., blocking up several feet of its length.

Side streets.

The side streets branching off from the main bazárs and the mohalla alleys are with few exceptions both unpaved and undrained. The few that have been paved during the last two or three years are by the faulty construction of the pavement converted into wide shallow drains and nothing more. The bricks have been accurately laid so as to convert the whole roadway from side to side into a wide shallow saucer-shape drain, and this receives the sewage from the houses on each side, and gives passage to the traffic of foot passengers and cattle through it. None of them are finished, and the sewage running down the paved roadway spreads over the unpaved street where the pavement ends. The construction of such pavements is a mere waste of money, for they are serviceable neither as roadways nor drains. They should be replaced by pavements similar to those in the main bazárs, with a "fish back" roadway, and open surface gutter at each side. All the unpaved streets and alleys that I saw were in a very filthy state. The surface of the roadway was everywhere much worn by traffic and streaked in all directions by foul, black lines of sewage from the houses on each side, and dotted here and there by miry puddles of the same which had lodged in the numerous hollows of the surface.

House sinks and mohalla alleys.

None of the houses, so far as I saw, were provided with sinks. Most of them had sewage gutters running down the street wall, or, as is the case with many, they shoot their sewage straight down on to the roadway through a spout projecting a foot or so from the upper stories. The ventilation in these mohalla alleys is extremely defective, and their conservancy is entirely neglected. I found deposits of ashes and night soil or ordure from the houses at frequent intervals all along the road sides and the general surface of the roadway very dirty and unswept. The air in all these quarters was charged with all manner of foul stinks, which even in this favorable season of the year rendered the town through them very disagreeable. In the hot weather and after rains the atmosphere of these dwelling quarters must be unbearably foul. My tour through these quarters was made at and after midday, and up to that time I saw no evidences of any scavenging. In fact these quarters never do get any regular or systematic scavenging, and they are certainly the filthiest native quarters I have yet seen in this Province. That they have not proved more immediately injurious to the general health of the population is attributable to the accidental circumstances affecting the water-supply as I shall presently have to mention.

The conservancy of these quarters should be at once taken into serious consideration by the Municipal Committee. I would suggest that a plan be prepared for the whole town, and the pavements and drains be laid down on a regular system, and taken in hand piecemeal, as funds enabled the work to be carried out to completion. Heretofore it appears that drains and pavements have been laid down here and there at haphazard without regard to levels or other considerations of efficiency, and with the result merely of removing the sewage from one place to strand it in another, in a concentrated form and increased quantity; in short to shift the evil from one spot and to intensify it in another without any step in advance towards ridding the town of it. The town is supposed to be drained and sewered by a system of open surface gutters and underground drains which discharge into the ditch encircling its walls. But as a matter of fact it has no such system of sewerage. The town really consumes its own sewage. I made the entire circuit of its area and everywhere found the ditch perfectly

dry, though strewed with all manner of rubbish, litter, and filth. With only two or three exceptions in which the outfall sewers were moist with a thick and black deposit of sewage silt, but with no liquid flow, none of the score or more of drains and sewers opening on to the ditch through the town walls showed any signs of being even wet. They were, as I saw them, perfectly dry and more or less encumbered or choked with dust and street litter. The sewage which they were laid down to conduct out of the town area was all exhausted on the surface of the town streets and alleys, being spread broadcast over them in grimy streaks and filthy puddles of black muck. Some idea of the quantity of this stuff daily poured on to the surface of the town area may be derived if we allow only ten gallons of water per house. In the return furnished to me by the Secretary of the Municipal Committee the number of inhabited houses and shops together is 18,300, but it is not specified how many of these are in the town and how many in the suburbs. But if we take only half the number as within the town walls we shall have at the rate above assumed 91,500 gallons of fouled water daily let on to the surface of the streets and courts, and this apart from the drippings of some 20,000 head of cattle, goats and sheep, and other live stock stalled within the town walls. None of all this quantity of liquid reaches the town ditch through its sewers or drains. Some of it is carried out (or supposed to be) by the sweepers in earthenware pitchers and thrown on to the surface of the fields around, but this is only from the sinks in the line of some of the main bazár drains in which the natural level does not admit of a steady flow along an uninterrupted channel. All the rest which is nearly the whole of the town sewage is disposed of by absorption into the porous soil or by evaporation on its surface.

The sewerage of this town requires to be entirely remodelled on a uniform and corrected system. At present the drains radiate from the central area to the periphery, and there pass out through the town walls into the ditch forming some score or more of independent sewerage system. Their only use, so far as I can see, is to give passage to the storm waters of the town, which in the climate of this region are ordinarily very scanty. They certainly do not give passage to its sewage.

Water-supply.

The water-supply of the town is from wells, and during six months of the year this is supplemented by the inundation canals before mentioned. There are 400 wells inside the town, and 425 outside in and about the suburbs. The depth of the wells inside the town varies according to the ups and downs of the surface, but on the outside their average depth is about 30 feet including 5 feet of water at this season. The water in all the wells is sweet; brackish wells are unknown here. During the flood season when the canals are running, the water in the wells, both in and outside the town walls, rises from 3 to 4 feet or more in the shafts. It is this fact of the annual change of its well water which has most probably saved the town from the ill consequences of its very neglected sanitation and defective conservancy. At the time of my inspection I heard several complaints on the score of the well water. The Kupwala well in Pipal Sawan Kirpul bazár was said by the people of the bazár to be polluted by sewage, and the water to have a disagreeable taste. It has a drain running close on three sides of its shaft, and I found each drain in a very filthy state from want of proper flushing. Just where the three drains join, and only some 12 or 14 paces from the well, is a sink in the line of sewer drains, and there is another on the same drain and nearer to the well. I found both sinks full of liquid sewage. Another well at the further end of the Kup and near the Ahmed Shah mosque was said to have gone bad, and its water to have a disagreeable smell and taste. In both cases the water was clear to look at, but I observed that there was a quantity of floating wood and other vegetable matter in each well. Both these wells should be closed to public use till they have been cleaned out and purified, and the water of both should be analysed before they are again brought into use.

The measurements of 6 wells inside and 6 outside the town were obtained for me by the Secretary of the Municipal Committee. They generally have good shafts, and those that I saw in the town were tolerably well kept in their surroundings with the exception of those mentioned. I noticed that the parapets in several were merely a boarding of planks. This arrangement affords no protection from surface drainage or from the back flow of spillings. I think these wood parapets should be replaced by masonry ones with conduits for the spill water to the nearest drain.

There are 9 tanks about the town, only one of which is of pakka masonry. They are all dry at this season.

The duties of the conservancy establishment are confined to the main bazárs and public thoroughfares, and appear to me to be much neglected. I found the drains in their charge everywhere very dirty and unswept, whilst in the mohallahs there was no scavenging done at all.

These conservancy sweepers, however, have nothing to do with that part of the town. The bullock men have those quarters to themselves, and remove only the night soil for trenching at the appointed sites outside the town, and even this is done in a very indifferent manner. The whole establishment requires to be remodelled on a working plan. I would recommend also that the municipality take the conservancy of the entire town under their control, and dispose of the refuse of the streets and night soil of the houses on a regular system by sale for fuel or manure. The proceeds of the sale of this stuff last year produced only Rs. 300, with a little management the town sweepings and night soil ought to produce more than that sum monthly.

From all I heard and saw at the time of my inspection, it is evident that the members of the Municipal Committee do not take much interest in the sanitation of their town. This is very much to be regretted, for there is a great deal to be done here before this first-class municipality can compare favorably with many of the second-class in this Province. At present it is in a discreditably backward state. The

points to which I would beg to invite the serious attention and consideration of the members of the Municipal Committee as those requiring immediate remedy are the unsatisfactory conditions of the mohallah alleys and thoroughfares, the total absence of any organized system for their conservancy, and the loss of income from neglect to utilize the sweepings of their streets. I would also suggest the remodelling of the present conservancy establishment under an active and intelligent Darogha or Inspector, so as to take up the conservancy of the whole town instead of, as at present, only the bazárs and public thoroughfares. It appears to me that there are too many overseers in the present establishment, and that the sweepers are not paid enough to secure their full services Rs. 3 per mensem is insufficient to support a man and his family, and he must neglect his proper work to seek other jobs.

Latrines.

There are 21 public latrines in and about the town, *viz.*, 15 for men and 6 for women. They are all built of kacha masonry on the usual plan, without roofs and without furniture or utensils of any kind. I found 5 or 6 which I inspected in a very foul state, despite the plentiful dusting with dry earth they had just before my arrival received as a change from their usual state of neglect. The soil from these latrines is buried in trenches on the south-east side of the town together with that from its interior, and is sold as manure in the form of *poudrette*, but owing to want of proper management it yields merely a nominal price, no means being employed, to limit the quantity carried away by a purchaser in excess of his rights.

Burial and cremation grounds.

There are 8 burial grounds and one cremation ground round about the suburbs. The cremation ground is at a good distance beyond the Delhi gate, and is well kept. I saw three grave yards and found them in good order.

Slaughter yard.

The slaughter yard also is well kept and in good repair.

Climate.

The climate of this place is said to be undergoing very appreciable changes in consequence of the spread of arboriculture, and yearly to be becoming more temperate and humid in opposition to its previous reputation for aridity and excessive heat.

Meeting with the members of the Municipal Committee at the town hall.

After my inspection I met three of the native members of the Municipal Committee at the Town Hall, (the rest being absent from the station) and spoke to them at length on the very serious defects I had noticed in the sanitary arrangements of their town, and pointed out the necessity of their stirring themselves to improve the conservancy of their mohalla quarters as the first step towards the attainment of a breathing air free from the contamination of decaying animal and vegetable refuse, and as absolutely necessary to preserve their well water from pollution by percolation through a porous soil. Of these native gentlemen Makdum Pír Bakhsh (who had accompanied me in my tour of the town) took a decided interest in the suggestions I offered, and expressed his intention of bringing the subject of conservancy forward at the next meeting of the Committee, with the view to some regular plan being decided upon for working the conservancy of the whole town under one establishment.

MUZAFFARGARH.

Inspected 3rd and 4th February.

Chief features of the town.

The town of Muzaffargarh has a population of 2,537, and contains 1,215 houses, of which 398 are shops. There is also a public serái just outside municipal limits. The greater part of the town is inside the walls of a compact square fort, around the walls of which a thin belt of suburbs has grown up. The walls are lofty and must interfere with the ventilation of the interior. They are useless as defensive works, and are rapidly going to decay. The process might with advantage be assisted here and there by opening gaps for free ventilation. There are 4 gates one on each face of the fort, and the streets passing straight between the opposite pairs cross in the centre of the town, thus dividing it into 4 main quarters. These main streets are the principal bazárs of the place. I found them well paved and provided with open surface drains at each side. They were very well kept and generally free from filth, but I observed that the side drains or gutters were not so carefully swept as they should be, and in many parts there was a good deal of sewage silt allowed to deposit on the sides of the gutters, thus obstructing the channel and forming a source for the exhalation of offensive odours. In two or three spots also I noticed that the gutter was entirely choked up, and in fact nearly obliterated by street sweepings and rubbish &c., trodden into it. All these extraneous matters should be removed from the drain channels, and the gutters be then kept well cleaned and in a wholesome state by daily sweeping and flushing. This is easily effected by only a little attention, and should not be neglected. This sewage deposit is not only offensive and unsightly, but it rots away the masonry of the gutters.

Side streets and mohallah alleys.

In the side streets and mohallah quarters there are no gutters or drains, nor are there any house sinks. In some few spots a large *nánd* or pottery basin is sunk on the surface at one side of the roadway and serves the purpose of a public sink for the whole alley. The plan seems to work well, and might be advantageously extended all over the town. I found the mohalla alleys, notwithstanding the absence of gutters and sinks, in a remarkably clean and tidy condition, in very striking contrast to the filthy condition of the like quarters in the city of Mooltan. The town here is very carefully looked after by the Civil Surgeon who periodically visits its general quarters in communication with the members of the Municipal Committee. I found these alleys and passages everywhere quite dry, and the air of the quarters generally free from those offensive odours which assail the visitor in like quarters of most other native

towns. The interiors of some of the dwelling houses I peeped into (and their private courts were not so clean and tidy as they should be,) and I saw enough to convince me that very much of the house sewage is consumed in the premises where it is produced, by absorption into the soil upon which it is recklessly cast. I would suggest for the consideration of the Municipal Committee the advantage of their pointing out to their townsmen the evils of this systematic filthification of the surface ground in and about the private dwelling houses and the easy way in which they can prevent it by the use of the "nánd" arrangement in each house in the same way as they see it worked in the public alley. I mention this as a very simple and easily worked arrangement to meet the natural carelessness and laziness of the different house occupiers who prefer to empty their slops on to the surface of their courts rather than endure the trouble of carrying it 50 or 60 or more yards to the public sink. The drainage of the town is supposed to be carried off into the low ground to the south-east and beyond municipal limits, but this is only the case when there is any drainage to be carried off. The sewage of daily production is for the most part consumed within the quarters producing it. None of it passes out of the town in the gutters, and what is removed in jars by the sweepers is only what is collected in the public sinks and forms but a small part of the whole.

Civil Station and suburbs.

The suburbs and the Civil Station to the north and west of the town are well kept, and generally clean. I was informed that some of the householders in the suburbs were very careless in the matter of house conservancy, and took no notice of the municipal regulation regarding the public thoroughfares. I observed 2 or 3 houses on the north-east side of the town walls, the surroundings of which were in a very untidy and unwholesome state. These houses were at the side of the public highway, and discharged their sewage on to it. Just preparatory to my arrival a small trench had been cut in the surface to connect the house drain with a pit dug at the roadside. This should be at once put a stop to, otherwise the ground here will very soon become saturated with sewage and become a dangerous nuisance. The occupants of these houses are I understand clerks in Government employ. They should be warned at once to remove the nuisance commenced. Their houses being so close to the outside cultivation there is no reason why they should run their sewage and slops on to the public road. I have thought it right to mention these cases, because it is the accumulation of individually trifling cases of this kind which go to make up the sum of a towns neglected conservancy and consequent insalubrity. In this little town I am glad to be able to report that there is evidently some interest taken in its sanitation by the local authorities and members of the Municipal Committee, and they have done much to keep it in a wholesome state, but there is still much to do, and their unceasing attention is required to complete the arrangements for the efficient scavenging of the place. The points which seem to require the earliest attention are the cleaning and flushing of the side gutters of the public roads and bazárs, and the introduction of the "public sinks" or *nánds* into these parts of the town not already provided with these receptacles of its daily sewage and slops.

Water-supply.

The water-supply of the town is from wells and from some tanks in the vicinity of the suburbs. There are altogether 17 wells within municipal limits of which 6 are within the fort walls. They all contain sweet waters and rise 2 or 3 feet in the flood season. The average depth of the wells outside the walls is 21 feet, and of their water at this season 8 feet. Inside the town owing to the rise of the ground the depth is somewhat greater. The wells I saw in the town are generally well protected from surface impurities, and were kept clean. They are most of them worked by Persian wheels and suffer all the defects of that arrangement, often to the extent of the water being so tainted with the rotting materials of the wood work and ropes as to be disagreeable to smell and taste.

With the water so near the surface as it is here, it seems a pity that the Municipal Committee have not turned their attention to the use of pumps. I beg to submit the subject to their consideration, and feel sure that the introduction of this means of drawing water will prove of the greatest use and benefit. In the first place the common hand pump is less costly than the Persian wheel and not liable to decay with the same injurious consequences to the quality of the water. In the next they are more easily and constantly worked, and are always ready. If when first introduced, the pumps are placed under the charge of an intelligent servant of the municipality, whose duty would be to look after them and explain their use to the people, there is no doubt they would soon become popular, and escape being spoiled or put out of order by careless or ignorant handling.

Public latrines.

There are two public latrines here for women, and none for men. Both are mere mud wall enclosures, and one of them is out of use from decay. The other which is close outside the town walls on its west side is altogether a very filthy place. At the time of my inspection the upper crust of filth had been removed, and the surface was clear and swept clean, but the stink of the whole place was unbearable, and indicated that the soil was saturated with excreta to an incurable extent. I see no remedy, but a change of site and plan.

Conservancy establishment.

The conservancy establishment is a small one, but it seems to be well looked after, and does its duties fairly well. If some bhistis were added, they would facilitate the flushing of gutters and keeping the drains clean. The town refuse and sweepings is sold to a contractor @ Rs. 70 for last year. This is proportionally much more than is realized at Mooltan for this sort of stuff, but yet far short of what with good management it ought to yield.

Vaccination.

Vaccination is fairly carried on here under the direct supervision of the Civil Surgeon, and consequently most of the towns children are vaccinated.

MONTGOMERY.

7th February 1879.

Chief features of the town.

This place came into existence some 12 years or so ago in connection with the Railway to Mooltan, and may at present be considered to be in its infancy, so far at least as regards the native town, to the sanitary condition of which my report mainly refers.

The population is 2,416 and the number of houses 494, of which 67 are uninhabited. There are besides 91 shops, of which 15 are unoccupied. The town is laid out on a good plan, with wide straight streets crossing at right angles and allowing of free ventilation, but at present much of the original plan is still unbuilt, and the occupied portions are in a more or less incomplete state; whilst sanitation and conservancy exist only in name.

Main bazár

The main bazár is the only paved and drained street in the town, and at the time of my inspection was in a very untidy and neglected condition, notwithstanding that it is the only part of the town which receives any attention from the conservancy establishment of the municipality. This street which is capable of being very easily converted into a fine boulevard is metalled with kankar along its central line, and has an open surface drain running at each side, with a row of young trees between them and the central roadway. I found it entirely unswept and the side drains more or less choked up by rubbish and litter that had been allowed to accumulate for months. These drains are utterly useless as such either for sewage or rain, of which the former it appears is even rarer here than the latter which does come in its seasons. The whole of the slops, sewage and waste water of the houses is consumed on the spot where it is produced, and is rapidly converting the surface crusts into a sewage tainted soil, whilst at the same time it loads the atmosphere with all manner of objectionable odours and exhalations. In the dwelling quarters and side streets there are no signs of any attention being paid to the conservancy of these parts. I found the streets and thoroughfares everywhere unswept and encumbered here and there with all manner of filth, evidently house sweepings and ordure which had become scattered over the roadway by traffic and passage of cattle &c. In some parts it seemed that the people habitually used the roadsides as public urinals and latrines.

Conservancy.

The conservancy of this town is sadly neglected, and this is the more to be regretted, as it has the advantage of a fair start and unusual facilities for a thorough and effective scavenging.

The conservancy establishment consists of one mate @ Rs. 6; of 9 male and 2 female sweepers @ Rs. 3-8-0 each per mensem, and of one bhisti @ Rs. 5 per mensem. The mate is also Chaprassi and registrar of births and deaths. I heard numerous complaints both from sweepers and mate of the hard work, and want of system under which they were employed, and of the inadequate pay they received. Whatever the grounds of their dissatisfaction, there is no doubt the work they profess to do, and for the discharge of which they are entertained, is not done at all as it should be. The sweepings of the town are carried out and cast on the ground at a spot 500 yards or so beyond the walls, and here the stuff is trenched whenever opportunity allows of leisure to dig the trenches. At the time of my visit 4 of the conservancy sweepers were engaged in trenching some of the refuse and dung heap matter that covered a considerable extent of surface without any boundary limits.

The whole subject of the conservancy of this town requires the immediate and serious attention of the Municipal Committee, for besides its human population no less than 681 head of cattle are stalled nightly within the town, *viz.*, 300 horned cattle, 300 goats and sheep, 81 horses, asses, &c., which is at the rate of more than one for each house.

The conservancy establishment requires to be thoroughly re-cast, and established on an adequate scale to provide for the conservancy of the whole town. This being a new settlement, there should be no difficulty in treating the whole as one. The points I would suggest for the adoption of the Municipal Committee are the following:—

1*st.*—The increase of the Municipal conservancy Establishment so as to include the service of the whole town, under an active and intelligent Darogha.

2*nd.*—The storage of town sweepings and filth &c., including ordure in dung godowns which should be merely plots of ground enclosed within mud walls 3 feet high. The site on which the town filth is now cast might be converted into a dung godown by simply enclosing it within low walls, so as to admit of the donkey loads being emptied over them.

3*rd.*—The contents of these dung godowns to be sold as manure and stored till thus disposed of. The stable litter &c., can be reduced in bulk by fire, which might be kept smouldering inside the enclosure at all times.

4*th.*—Large *náuds* to be provided for use as public sinks in the mohullah quarters. They should be sunk in the ground at the roadside so as to leave only an inch or so of the rim above the general surface, and be emptied out daily by the sweepers removing the contents in *chatties* either to the cultivation around or into the general mass of filth in the dung godown. By the adoption of these *nands* the ground about the houses will be saved from daily pollution by house sewage and scullery slops, &c.

5th.—Dust bins (like those in use at Delhi) should be provided for the several mohullahs as the receptacles for garbage and house sweepings &c., till removed by the sweepers. These dust bins are merely deal boxes about 5 feet long by 3 feet wide and 4 feet high. They have no bottoms, and the cover is a mere lid which works on hinges. The bin is set down at the roadside in some convenient spot and the sweepings &c., of the several houses around shut into it by merely raising the lid on each occasion. When the sweepers come round, they tilt up the box by the handle at one side, and remove the contents off the ground on to their donkeys or carts as the case may be. They then sweep the ground clean, and set the box or dust bin down again as it was before. The adoption of some such aids to the conservancy establishments will greatly facilitate the work of keeping the place in a wholesome state and at the same time economize a material which can be sold profitably as manure, and one too which rather improves than otherwise by keeping.

Latrines.

There are 3 public latrines here. They are all built of mud masonry, and had thatched roofs At the time of my inspection the roofs of 2 of them had fallen in, and the floors of the passages were used as latrines instead of the blocked up compartments. They were in a generally ruinous and altogether neglected condition, and in a very foul state. The soil was saturated with excreta, and the air of the entire vicinity pungent with ammoniacal stinks. They would be better razed to the ground and the site ploughed up than to be left standing in their present condition.

Water-supply.

The water-supply is from wells only. There are 6 inside the town, and 46 in and about the station and municipal limits. The average depth of the wells from top to bottom is 66¾ feet, including 5 feet depth of water and 63 feet height of parapet. The water is sweet, and is considered good. It is not affected in its quantity or quality during the rains, though the station is sometimes flooded by surface drainage during that season. The drainage of the town is provided for by a surface cutting which conducts from its main gateway by the line of Railway, past the police lines and jail on to a wide hollow in waste land 2 or 3 miles away to the south-west. The main channel of the drainage cut is much blocked by drift sand, and the growth of tamarisk bushes, and last year the obstruction lead to a serious inundation of the whole station, and the fall of part of the jail wall.

I beg again to report the necessity there is for a thorough re-organization of the municipal conservancy establishment and the regulation of scavenging duties.

DELHI.

19th to 21st February.

No improvement in the sanitary condition of the city since last report made in December 1877.

I regret to say that so far as concerns the sanitary condition of the city, I am not able to record any improvement upon the state of affairs described in my inspection report submitted in December 1877. The lanes and streets of the mohullah quarters are in the same very filthy and unwholesome condition that they were when I last visited this place on the above specified date, and the scavenging of the city is on the same irregular and worthless system that I then found it. The Sanitary Inspector Mr. Danenberg, was absent on leave at the time of my visit, and Mr. Haddis, the Municipal Secretary, accompanied me through part of the town between the Farash Khana and Lahore gates. The state of the bye-streets and courts in this and other parts of the city is simply a disgrace to the municipality and evinces a neglect of the interests of their fellow citizens which was not to be expected from the members of the Municipal Committee. Beyond the construction of a number of public, (and they certainly are very much so), urinals of a greatly improved pattern, the only defect of which is the want of privacy I could see no traces of any attempt having been made to put the scavenging of the city upon a proper or efficient footing, nor has anything been done to improve the sewerage system of the intramural area. At the time of my inspection the sewers and drains were being cleared of the filth and muck in their channels, and I had an opportunity of seeing the vast amount of sewage silt that was brought out of these channels which were originally laid down for the purpose of affording a free exit to the sewage of the city. The immense mass of this filth which I saw was I understand the accumulation of one year, and it was certainly enough to impress upon my mind the urgent necessity of an immediate action being taken to put the sewerage of the town upon a proper footing. The question of the sewerage is I understand included in the scheme projected for the proposed water-supply, but I do not see why it should not be proceeded with independently of the latter. I consider that the sewerage of this great, important and wealthy city requires immediate attention, and cannot understand why it should not be taken in hand independently of the water-supply project, which to judge from the past is yet far from accomplishment unless some earnestness of purpose is imported into the undertaking in place of the hitherto dilatory treatment it has received.

Nothing could well be worse than the present state of the sewerage here, and I see no way of improving it in a practical manner short of an entire closure and removal of the present drains and sewers, and their replacement by a uniform and connected system of open surface gutters at the road sides. These might all discharge into a circular outfall sewer of capacity enough to receive the stream of the sewage of the whole intramural area. This subject requires the immediate and most serious attention of the Municipal Committee, and should be dealt with decisively and promptly.

Accompanied by Mr. Devon, the Municipal Engineer, I visited the site from which it is proposed to draw the permanent water-supply of the city in connection with the project now under consideration of the authorities, provided of course that the water be pronounced good after due analysis and investigation. I was surprised to find that the experimental shafts had been sunk on the edge of the permanent or cold weather channel of the Jumna at a spot only a few score yards from the principal cremation *ghát* of the city, and on ground in other respects by no means promising a good or wholesome water-supply. The site on which these shafts have been sunk, is a sandy reach in the bed of the river Jumna just opposite the Khadsia Bagh, through which passes the outfall drain of the northern suburbs of the city, and at no great distance from the city walls. The site itself is otherwise faulty in respect to the nature of its soil and the circumstances of its permanent condition. As mentioned it is merely a reach or sandy beach thrown up by recurring periodical floods in one of the windings of the permanent stream in the wide channel of the river bed. Its surface is over grown with reeds, and towards the land side is covered by a dense population of tamarisk and other bushes. During 3 or 4 months of the year the whole area is under water and thoroughly water-logged, and during another 3 or 4 months it is more or less of a marsh, whilst for the rest of the year it is merely a sandy, and in parts loamy layer of soil heavily charged with moisture and the debris of organic forms, both animal and vegetable.

At the time of our visit to these experimental shafts Mr. Devon drew up samples of the water for transmission to the Chemical Examiner Lahore for analysis and report. The water was drawn from two tubes about 80 or 100 paces apart and in each instance was distinctly turbid with a faint greenish hue and certainly did not look inviting. The soil through which the shafts were sunk is a loose sand full of decayed vegetation and crossed in all directions by the roots of the grasses reeds and tamarisk growing above.

I would beg to submit for the earnest consideration of the Municipal Committee the advisability of their taking up this question of water-supply with the attention which the importance of the subject demands. It is mere waste of time and money to deal with the question in a half hearted or dilatory manner, and it is by no means creditable to their management that the proposed scheme should have been so long under consideration, and be no nearer accomplishment now than it was nearly three years ago. It is not necessary that they should limit their search for good water to the immediate precincts of the city, and it may possibly be necessary for them to do as other municipalities have had to do, that is to go for their water several miles distant. These two questions of sewerage and water supply in my opinion require immediate attention by the Municipal Committee, and whatever is done should be done with purpose and not perfunctorily. If taken up with the earnestness which the importance of the matter demands, there is no reason why the putting in hand of a new sewerage system should be delayed or the discovery of a source of water-supply be indefinitely deferred.

In my report previously alluded to, I recommended that the conservancy of the whole city should be undertaken by the municipal establishment in the same way as was provided for the public streets, &c., but I do not see that anything has been done to ameliorate the most unsatisfactory state of affairs described in that report. I beg again to draw the attention of the members of the Municipal Committee to this subject, and point out to them that what has been effected in this way at Amritsar may also be effected here. At present the municipality not only loses a large sum of money yearly by the mere neglect to collect it, but the citizens are exposed to the evils of a very faulty and inefficient conservancy through bad scavenging and waste of resources. The entire conservancy establishment requires to be re-organized, and worked upon a comprehensive and systematic plan. With the example of Amritsar (itself by no means perfect) before it, it will be a reproach to the management of the Municipal Committee if Delhi is allowed to continue in its present condition of internal filth and pollution.

GURGAON.

24th and 25th February 1879.

I inspected the station and village of Gurgaon in company with the Civil Surgeon and Táhsíldár.

Latrines.

The station I found in good order and remarkably well kept in point of conservancy. The very faulty condition of the public latrines recorded in the report submitted after my last inspection of this place has been remedied, and I found these places in really good order. They had been provided with light thatch roofs and furnished with the requisite utensils, and at the time of my inspection were well served with dry earth, and were altogether in a commendably clean and wholesome condition, though even more frequented now than previously. In the one adjoining the Ghamandi serai, the end compartment in one direction is set aside as a lavatory, its conduit gutter emptying into a sink outside, and it is proposed to add a shed to the end compartment in the other direction for the storage of dry earth and the sweepers' tools. When this is done and a pair of baskets or buckets are provided for the removal of the excreta, these latrines will be perfect of the kind, and will only need proper attention and service to be always preserved in a wholesome state. In the Cowan serai latrine there is a dry earth store, but no lavatory. This last I understand is to be provided at once, and new shovels and baskets are to be served out to the sweeper in charge. Only one sweeper is told off to the service of each latrine, and he has also to look after the scavenging of the adjoining serai. This work is more than one man can do, and the consequence is that the serais are neglected. I found the interior of the Cowan serai in a very untidy and unswept state, and the surroundings of its well very foul with sludge and muck. The watering trough attached

to the parapet was thickly coated with a stinking black deposit, the accumulation of months of neglect, and was in consequence utterly useless for the purpose of its construction. The whole interior of these public serais requires a general sweeping and cleaning, and once fairly started in good order should be easily kept so by daily attention. But this work requires the entire service of at least one man, and I would recommend that he be appointed as soon as possible. I found the main bazár in good order, and the Jail and Dispensary both admirably kept.

Conservancy.

The village of Gurgaon is much in the same filthy and unwholesome condition as when I last inspected it, and nothing seems to have been done towards a systematic removal of its litter and rubbish. Though hastily swept up just before my arrival, I found the alleys and courts everywhere encumbered by stable litter, house sweepings, garbage and ordure, and the air of the place distinctly unsavoury. I would recommend that the village headmen be advised to meet in consultation with the view to arriving at some practical line of action for the regular and systematic removal of such refuse matters to convenient sites, outside the village area. I visited the *Masáni* or shrine dedicated to the goddess of small-pox, which is attached to this village, and found the extensive camp ground belonging to it in good order. The day of my visit happened to be a festival day devoted to visitation by children, and I found about 150 or more of them with their parents and their travelling carts &c., on the ground. The village headmen informed me that it was the custom of Hindus to make offerings to the goddess by way of propitiation and protection for their children against small-pox, and that it was considered incumbent on them when practicable to perform a pilgrimage to her shrine, the time of such pilgrimage being left to individual convenience, though certain fixed dates were recognised as festivals of the goddess, and that visits to the shrine on these occasions were preferable. The devotees include those who came to return thanks for the recovery of their children from an attack of the disease as well as those who desire to intercede with the goddess for the safety of their children in the future. Children, with the disease actually on them, are, I was assured, never brought to the shrine, though many are brought soon after the scabs have fallen off, and the convalescent is considered fit to travel. I went in and about amongst the party I found on the ground, and was struck with the generally healthy and happy look of all. Several of the children had small-pox marks, but none were of recent date so far as I saw, but most of them had no such signs of having suffered the disease. The festival was only for that day, and to me seemed like a merry picnic, the children being amused with games and toys, whilst the cooking going on in all directions indicated a treat later in the day. On the occasions of the greater festivals, one of which lasts for a month, the people assembled here number from 12 to 15 thousand or more, though the same people seldom stay more than 3 or 4 days, and on these occasions there are special arrangements made before hand for the safety of the crowd in respect to sanitation, police and medical care. I did not hear of any ill consequences proceeding from such annual gatherings.

REWARI.

26th February.

Conservancy arrangements most unsatisfactory.

I found the town in much the same unsatisfactory state as regards the conservancy of its dwelling quarters as that described in my last report on the place. Apart from the main bazárs and public roads, the business quarters in fact, the town has no conservancy. In all my tour of the place I no where came upon a drain or gutter (there are certainly very few of them in the town), which bore any signs of moisture, nor of any sewage conduits leading to them. The sewage of the town is consumed on the premises of the several tenements producing it, or as is the case with many of them, is discharged on the public roadway where it forms wavy streaks of foul black sludge. The surroundings of the wells in most parts of the town which I saw were in a repulsively filthy condition. In fact the state of the town indicates a neglect of ordinary attention to even the simplest measures of conservancy, which is I think highly discreditable to the management of the Municipal Committee. Nothing has been done towards organizing a regular system of scavenging to include the dwelling quarters of the town, nor have any steps been taken to dispose of the sweepings for the benefit of the municipality, a neglect which, apart from its more serious evils, represents a money loss of some 10 or 12 thousand rupees a year which the municipality might easily realize by its collection and sale.

Address to members of the Municipal Committee.

After inspection of the town I met the members of the Municipal Committee in their Town Hall, and addressed them at length upon the very filthy condition of things we had just witnessed, and begged them to lose no time in taking the subject under their serious consideration. I drew their attention to the import of the facts with which they had furnished me in the course of our tour through the town to the meaning of from 18 to 20 gallons of foul water (apart altogether from the droppings of 3 or 4 thousands head of cattle stalled in their courtyards) being daily cast on the grounds of each of the 5,700 houses of the town without any provision being made for its outflow or any means existing for its exit; to the evils and disagreeables of filth of all sorts strewing the surface of their dwelling quarters in all parts of the town; and to the fact that the water in most of their wells was brackish, and in many, as they assured me, undrinkably so. I explained to them how the neglect to remove the daily accumulation of filth and sewage from their dwellings operated to pollute the air they breathed and the water they drank, and begged them to give their earnest atten-

tion to the subject with the view to the adoption of some practical and efficient means of scavenging for the whole town. I reminded them that their municipality had been in existence for 12 years, and pointed out to their notice the improvements that had been effected during that period in the main bazárs and public thoroughfares, and told them that they only wanted earnestness of purpose to extend the same improvements into their dwelling quarters. What had been effected in this respect by other municipalities might also be effected here, and I advised them to study the system which is working so satisfactorily at Amritsar with the view to its adoption for the scavenging of this town.

The members of the Municipal Committee acknowledged the justice of my remarks, and gave me to understand that they would take up the subject in earnest. I trust they will succeed in overcoming whatever difficulties there may be in the way, and soon have the town in a cleaner state than it is at present.

RAWALPINDI.

19*th* *to* 21*st* *March* 1879.

Chief features of town.

The town of Rawalpindi has a population of 20,802 (census 1875) *viz*, men 12,778, females 8,024, and contains 4,773 dwelling houses, of which about 100 are unoccupied. There are besides about 2,000 shops and 8 seráis. About 50 of the shops are unoccupied. The town is open and situated on the north or left bank of the Leh rivulet which separates it from the military cantonment. The site of the town is relatively low, and its ventilation is in consequence not so free as that of the more elevated parts of the cantonment occupied by the British Barracks and Fort. The ventilation is also somewhat interfered with by the overgrowth of trees immediately round about the town. The site though relatively low as regards its surroundings, is elevated as regards its drainage, which is free and rapid by means of numerous gullies and ravines that empty into the channel of the Leh, without much absorption by the soil. The Leh where it winds round the town (at some little distance from the town itself) has a bed varying in width from 60 to 100 yards, with scarped banks of stiff red clay from 40 to 50 feet high. Its stream is perennial, and, though clean and sparkling, a few miles above the town is more or less turbid opposite its area of habitation. At this season the water is at its lowest and easily fordable in most parts. At the time of my inspection the bed of the stream was occupied opposite the town by scores of washermen and butchers. Whilst looking down at them from the bridge on the city road my attention was attracted to some people filling their pitchers and to two men who were lapping the water with their hands at only a yard or two below where a washerman was scouring his soiled linen. During the monsoon rains the stream is occasionally enormously swollen after any unusual downpour. The rise is usually very sudden owing to the impervious character of the soil, and the flood generally subsides in the course of a day and night to moderate proportions, which continue to rise and fall in alternation with the rains. The cold weather stream is not liable to floods, and maintains a tolerably constant volume. There are many water mills on the stream below the town.

Water-supply.

The water-supply of the town is from this river and from wells. The number of wells within municipal limits is 99, of these 34 containing sweet and 22 containing bitter water are inside the town, whilst 40 containing sweet water and only 3 containing bitter are outside the town. The proportion of brackish wells inside and outside the town is very noteworthy, and indicates the extent of the contamination in two different localities. Owing to the nature of the soil which is a stiff impervious clay, the chances are that whatever impurities may reach the well water they do so in an unfiltered manner through cracks and fissures in the strata and not by percolation through the soil. Of the risks of contamination by this means some idea will be formed by considering the surface drainage and sewerage provisions of the town.

Drainage.

The town as previously stated is an open one, that is to say it is not enclosed within walls. It has some very spacious and airy bazárs, and is on the whole by no means so over built and overcrowded as most Punjab towns. The main thoroughfares and bazárs are metalled with kankar, and the majority of the side streets and alleys are either paved with bricks on edge, or flagged roughly with flat stones. In these latter the gutter generally runs down the middle of the roadway and terminates on the surface of the ground on the outskirts of the town; whilst in the former when drained at all, there is an open surface gutter on each side of the roadway, and these connect at different points with a main outfall drain which empties into the Leh to the east of the town. There is no regular system of drainage or sewerage to include the whole town, and the main outfall drain above alluded to carries the sewage of only a small part of the town. At the time of my inspection (about mid-day) it contained a very thin and sluggish stream of sewage and gave off a very foul stink from neglect of proper flushing and sweeping. The drain is an open one, and passes through a very much frequented bazár, and requires therefore more than usual care to keep it in a wholesome state.

I found the roadways everywhere well swept and in a generally tidy condition, and was struck by the dry condition of streets in the dwelling quarters. This, I presume, is not their normal condition, for though in several of these side streets there were no drains of any kind, I noticed that the houses on each side had the usual outlets for waste and sewage water and several of them were wet. Judging from a few court interiors into which I looked, the dwelling premises of the town are far from

being as clean as they should be, and are not nearly so well kept as I found the streets to be. It is reckoned that on an average 20 gallons of water are used daily in each house, taking large and small together, and as there are 4,600 occupied dwelling houses, we may say that the quantity of water and urine derived from its consumers daily poured on to the ground in and about them is 92,000, or say in round numbers 100,000 gallons, and of this probably less than a fourth part is carried away by the outfall drain. Besides this quantity of soiled water daily poured on to the ground within the town area, there is another very considerable quantity represented by the urine of over 2,000 head of horned cattle, and about as many other beasts of sorts besides goats and sheep which are nightly stalled within the town; or say in all 2,000 gallons of urine. Almost all this liquid sewage, except what is carried out of the town by the outfall drain, is consumed within the town, either dissipated by evaporation in its atmosphere or disposed of by disappearance under its surface soil. And this is the routine of every day. With these facts before us it is no matter of surprise that only two-thirds of the wells in the town should contain sweet water. On the contrary, in a soil such as this in which the well water is not affected by the stream of the adjoining river, the wonder is that it contains a single well of sweet water. And indeed so far as I can understand those yet containing good and sweet water are expected to become brackish in the course of time as the water of some of them is already observed to be very hard and mawkish to the taste. I am not aware that any advance has been made with the water-supply project for this town, more than was recorded in my annual sanitary report for 1877, when the original scheme to bring the water from the Rawal stream at a point ten miles from the town was abandoned as too expensive, and replaced by the more modest proposal to augment the existing supply from a group of wells outside the city at a spot where the water is not far from the surface. But the state of the town wells and the Leh itself near the town are quite enough to render it highly advisable that immediate steps be taken for improving the quality of the water as consumed by the people. The one kind is either brackish or hard, and considered of inferior quality, and the other though considered of better quality and more easily digested is evidently very strongly charged with foreign matters, both animal and vegetable in a state of decomposition, whilst both alike are consumed without any cleansing process. In default of the practicability of the scheme originally considered, I would recommend the introduction of filter tanks and reservoirs in connection with the town wells and the Leh in the vicinity of the town.

Conservancy establishment.

The conservancy establishment attends only to the main bazárs and public thoroughfares, the rest of the town is left to the care of the mohalla residents and receives no systematic or regular scavenging. On the occasion of my visit the streets and thoroughfares were in a generally tidy and well swept condition, but it was by no means so with the courts, whilst the very strong smell of urine and other unsavoury stinks in most parts of the town indicated that filth and unwholesomeness were not strange to the place. In the main bazár I was surprised to find a public Seráí (Maharaj seráí) totally neglected as to its conservancy. Its area was covered with stable refuse, ashes and filth of sorts as if the place had never been swept. Its verandahs and chambers were neither whitewashed nor leeped and were covered with stains. The chambers were unventilated and grimed with soot. In the right hand corner opposite the entrance 2 or 3 chambers were in a ruinous state owing to their roofs having fallen in; they were used as a common latrine and were evidently never cleaned. In the area or yard near this was a dung heap of considerable size and the growth of several months. I have in no other part of the Province come across so filthy and neglected a place. The place it appears is not under the municipal conservancy establishment, but it must surely be under the control of the Municipal Committee who should see to its thorough renovation at once. The place should be closed to the public till put into a wholesome state and repaired and mud or lime washed throughout, and the area should be cleared of all its present accumulations of filth. The Deputy Commissioner gave orders for the removal of the dung heap forthwith, but the place requires a thorough refit before it can be fit for human occupation. The rooms should be ventilated by perforated tiles let into the walls under the roof.

The conservancy of the town is on no regular system, either as regards sewerage or scavenging. The former is for the most part consumed within the town area for want of proper drainage, and the latter are rendered inefficient by incompleteness and wastefulness of the system. The town sweepings are sold by auction, mostly as fuel for brick kilns, and last year realized the sum of Rs. 800, which is at the rate of one rupee. per 5½ houses per annum. The sum is capable of considerable increase.

Latrines.

There are altogether 30 public latrines around the town, 15 of them are of pakka masonry, but only two of them are roofed; the rest are kacha and include several mat screen latrines, each of these last consists of a long stage of planking running upon wheels and divided into compartments by matting spread over woodwork frames. They have no roofs, nor seats, but a slit in the flooring, and were meant to be dragged about the surface from spot to spot. These I saw however had become stationary and were perched upon small pillars of masonry which were just large enough to hold the wheel. The matting was a good deal worn, and altogether they looked very untidy, though very much better than the masonry latrines. These last of which I saw one unroofed, and one roofed were inexpressibly foul and more filthy than are to be found elsewhere, so far as I have seen of the Province.

The money spent on these latrines is so much money wasted with no other result than producing a nuisance. They have neither proper service nor utensils, nor dry earth; afford no shelter from the weather, and are so abominably filthy as to poison the air for some 60 or 80 yards around. It would be

far better to raze them and sow their sites with corn instead, and to raise boundary pillars within which it be prohibited to perform offices of nature. These latrines serve no single good purpose for their soil is not utilized in any way, and from careless treatment it is not converted into inodorous *poudrette* as it should, and very easily could be, but is stored in shallow trenches about the latrine to intensify its disgusting condition, yet with a little care, forethought and arrangement these places might be made and maintained as real conveniences to the public. They fail simply because they are not cared for, and I consider it an injustice to force the people to resort to them instead of the open country as I understand is the case. If the municipality insist on the people using their latrines, they are bound in fairness to maintain them in a decent and wholesome state so far as is possible. The whole of these latrines should be either put into a state of thorough repair or else demolished entirely. It is no use, however, putting a latrine into thorough repair and opening it to the public without at the same time seeing that it is provided with a proper service. It is not sufficient except to ensure failure to declare a latrine open to the public without any provision as to fittings, furniture, or service, and with merely a single sweeper on Rs. 3 or 3-8 per month to look after it. Where the municipality decide on giving such a sum for the monthly charge of a latrine, they will find no difficulty in getting some body to take the money, but they will and do not assuredly get even that money's worth out of the miserable, decrepid wretches who are generally found in charge of these places. The Municipal Committee should remember that conservancy is as important as police and education or any other of their municipal departments, and it requires as much attention and organization if it is ever to do any thing more than use up so much of their revenue year by year without any adequate return.

Address to Members of the Municipal Committee.

After inspecting the town I met the members of the Municipal Committee in their town hall and addressed them on the importance of the defects I had noticed and explained to them how they might be overcome. I found these native gentlemen intelligent, reasonable and willing to improve their town, but it was at the same time clear that they wanted a guide and teacher.

VITAL STATISTICS
OF THE
GENERAL POPULATION, 1878.

ANNUAL FORM No. I.

BIRTHS REGISTERED in the DISTRICTS of the PUNJAB during the year 1878.

1	2	3	4			5			6	7	8
Number.	Districts.	Population according to census of 1876-76.	*Number of births registered.*			*Ratio of births per* 1,000 *of population.*			Number of males born to every 100 females born.	Excess of births over deaths per 1,000 of population.	Excess of deaths over births per 1,000 of population.
			Males.	Females.	Total.	Males.	Females.	Total.			
	DELHI DIVISION.										
1	Delhi 6 Munl. towns ...	192,753	4,489	4,313	8,802	23·29	22·37	45·66	104·08	...	38
2	Gurgaon 4 „	59,867	1,070	1,035	2,105	17·87	17·29	35·16	103·38	...	63
3	Karnál 5 „	74,796	1,336	1,140	2,476	17·86	15·24	33·10	117·19	...	19
	HISSAR DIVISION.										
4	Hissar 6 Munl. towns ...	69,241	1,157	953	2,110	16·71	13·76	30·47	121·40	...	24
5	Rohtak 6 „	55,263	935	822	1,757	16·92	14·87	31·79	113·75	...	20
6	Sirsa 5 „	28,097	436	343	779	15·52	12·21	27·72	127·11	...	23
	UMBALLA DIVISION.										
7	Umballa 11 Munl. towns ...	103,811	1,552	1,418	2,970	14·95	13·66	28·61	109·45	...	17
8	Ludhiána 6 „	77,911	1,776	1,533	3,309	22·79	19·68	42·47	115·85	...	46
	JULLUNDUR DIVISION.										
9	Jullundur 12 Munl. towns ...	125,957	2,524	2,408	4,932	20·04	19·12	39·16	104·82	...	43
10	Hoshiárpur 10 „	80,069	1,463	1,287	2,750	18·27	16·07	34·34	113·67	...	9
11	Kángra 5 „	23,752	328	328	656	13·81	13·81	27·62	100·00	...	7
	AMRITSAR DIVISION.										
12	Amritsar 7 Munl. towns ...	169,770	3,294	3,187	6,481	19·40	18·77	38·17	103·36	...	27
13	Gurdáspur 15 „	87,367	1,409	1,262	2,671	16·13	14·44	30·57	111·65	...	3
14	Siálkot 9 „	71,941	1,159	1,000	2,159	16·11	13·90	30·01	115·90	3	...
	LAHORE DIVISION.										
15	Lahore 8 Munl. towns ...	171,600	2,940	2,662	5,602	17·13	15·51	32·64	110·44	...	18
16	Gujránwála 10 „	70,633	1,350	1,207	2,557	19·11	17·09	36·20	111·85	3	...
17	Ferozepore 7 „	31,976	792	686	1,478	24·77	21·45	46·22	115·45	...	39
	RAWLAPINDI DIVN.										
18	Rawalpindi 5 Munl. towns ...	44,440	940	825	1,765	21·15	18·56	39·72	113·94	...	28
19	Jhelum 4 „	34,677	524	506	1,030	15·11	14·59	29·70	103·56	...	21
20	Gujrat 4 „	41,856	853	749	1,602	20·38	17·89	38·27	113 88	...	3
21	Shahpur 6 „	45,388	1,232	1,088	2,320	27·14	23·97	51·11	113·23	...	...
	MOOLTAN DIVISION.										
22	Mooltan 7 Munl. towns ...	69,335	1,623	1,452	3,075	23·41	20·94	44·35	111·78	...	2
23	Jhang 5 „	38,850	673	639	1,312	17·32	16·45	33·77	105·32	1	...
24	Montgomery 5 „	21,055	385	355	740	18·28	16·86	35·15	108·45	...	11
25	Muzaffargarh 7 „	19,586	324	344	668	16·54	17·56	34·10	91·28	...	5
	DERAJAT DIVISION.										
26	D. I. Khan 6 Munl. towns ...	44,250	612	502	1,114	13·83	11·34	25·17	121·91	...	11
27	D. G. Khan 5 „	35,253	749	564	1,313	21·25	16·00	37·24	132·80	...	15
28	Bannú 4 „	20,925	366	309	675	17·49	14·77	32·26	118·45	...	17
	PESHAWAR DIVISION.										
29	Peshawar 2 Munl. towns ...	59,447	1,269	1,190	2,459	21·35	20·02	41·36	106·64	...	55
30	Hazára whole district	364,324	2,008	1,350	3,358	5·52	3·70	9·22	148·74	...	16
31	Kohát 1 town	11,043	59	51	110	5·34	4·62	9·96	115·69	...	9
	Total ...	2,345,233	39,627	35,508	75,135	16·90	15·14	32·04	111·60	...	21

NOTE—The population of the rural circle of Hazára is according to the census of 1868.

DEATHS REGISTERED in the DISTRICTS of the PUNJAB during the year 1878.

1	2	3	4	5	6			7	8			9		
Number.	Districts.	Population according to census of 1868.	Area in square miles.	Average population per square mile.	*Number of deaths registered.*			Number of males died to every 100 deaths of females.	*Ratio of deaths per 1,000 of population.*			*Mean ratio of deaths per 1,000 during previous 5 years.*		
					Males.	Females.	Total.		Males.	Females.	Total.	Males.	Females.	Total.
	DELHI DIVISION.													
1	Delhi	608,850	1,277	477	17,866	15,874	33,740	112	55	56	55	29	29	29
2	Gurgaon	696,646	1,980	352	26,348	20,958	47,306	126	71	64	68	20	19	20
3	Karnál	610,927	2,352	260	15,111	11,818	26,929	128	46	42	44	21	19	20
	HISSAR DIVISION													
4	Hissar	484,681	3,540	137	6,756	5,326	12,082	127	25	24	25	14	14	14
5	Bohtak	536,959	1,811	296	11,190	8,988	20,178	124	38	37	37	19	18	19
6	Sirsa	210,795	3,121	67	3,027	2,642	5,669	114	26	28	27	18	18	18
	UMBALLA DIVN.													
7	Umballa	1,008,860	2,621	385	16,630	13,016	29,646	128	30	28	29	21	19	20
8	Ludhiána	543,245	1,368	426	14,082	12,100	26,182	116	44	46	45	22	22	22
9	Simla	33,594	18	1,866	450	255	705	176	20	22	21	15	18	16
	JULLUNDUR DIVN.													
10	Jullundur	783,020	1,326	590	29,345	26,995	56,340	109	68	76	72	30	35	32
11	Hoshiárpur	938,890	2,086	450	18,829	17,200	36,029	109	37	39	38	30	31	31
12	Kángra	743,758	8,988	83	9,105	7,549	16,654	121	23	21	22	22	21	21
	AMRITSAR DIVN.													
13	Amritsar	832,750	1,562	533	20,622	16,770	37,392	123	44	46	45	29	32	31
14	Gurdáspur	906,126	1,818	498	14,574	11,668	26,242	125	29	29	29	28	28	28
15	Siálkot	994,458	1,955	508	13,268	9,853	23,121	134	25	22	23	26	25	26
	LAHORE DIVISION.													
16	Lahore...	775,551	3,659	212	19,380	16,253	35,633	119	45	47	46	29	30	29
17	Gujránwála	550,576	2,563	215	10,031	8,635	18,666	116	33	35	34	24	26	25
18	Ferozepore	533,416	2,739	195	12,970	9,854	22,824	132	44	41	43	18	18	18
	RAWALPINDI DIVN.													
19	Rawalpindi	699,647	6,218	112	14,126	11,909	26,035	119	37	37	37	19	18	19
20	Jhelum	500,988	3,910	128	7,689	7,132	14,821	108	29	30	29	21	20	20
21	Gujrat	616,347	2,029	303	9,688	8,020	17,708	121	29	28	29	18	17	18
22	Shahpur...	368,796	4,700	78	6,108	5,173	11,281	118	31	30	30	25	23	24
	MOOLTAN DIVISION.													
23	Mooltan	459,765	5,927	77	7,207	5,576	12,783	129	28	27	28	26	24	25
24	Jhang	348,027	5,702	61	2,398	1,902	4,300	126	12	12	12	16	16	16
25	Montgomery	359,437	5,573	64	5,886	5,098	10,984	115	29	32	30	23	23	23
26	Muzaffargarh	295,547	2,954	100	5,098	4,128	9,226	123	31	31	31	20	19	19
	DERAJAT DIVISION.													
27	Dera Ismail Khan ...	394,864	7,096	56	5,870	4,860	10,730	121	27	27	27	19	17	18
28	Dera Ghazi Khan	309,978	4,740	65	3,157	2,468	5,625	128	18	18	18	13	12	13
29	Bannu	287,547	3,171	91	3,405	2,796	6,201	122	23	21	21	16	14	15
	PESHAWAR DIVN.													
30	Pesháwar	500,443	2,497	200	7,110	5,705	12,815	125	26	24	26	12	11	12
31	Hazára	367,218	2,835	129	5,698	3,655	9,353	156	30	21	25	15	13	14
32	Kohát	145,419	2,839	51	931	640	1,571	145	12	10	11	9	8	8
	Total for the Province ...	17,487,125	104,975	166	343,955	284,816	628,771	121	36	36	36	23	22	22

ANNUAL FORM No. III.

DEATHS REGISTERED in the DISTRICTS of the PUNJAB during each month of the year 1873.

1	2	3												4	5
Number.	Districts.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total deaths registered during the year.	Number.
	DELHI DIVISION.														
1	Delhi	1,743	1,405	1,618	1,933	2,156	2,534	1,530	1,769	2,818	5,875	6,825	3,504	33,740	1
2	Gurgaon	1,915	2,144	2,956	3,410	3,102	3,604	2,387	3,248	5,807	8,219	7,342	3,172	47,306	2
3	Karnál	1,157	1,136	1,402	1,781	2,842	2,133	1,430	1,543	1,621	3,457	5,559	2,868	26,929	3
	HISSAR DIVISION.														
4	Hissar	945	695	717	749	865	971	674	568	1,361	2,022	1,575	940	12,082	4
5	Rohtak	1,323	974	1,009	1,092	1,077	1,347	809	986	1,590	3,999	4,127	1,845	20,178	5
6	Sirsa	363	355	456	480	484	486	388	248	474	839	652	444	5,669	6
	UMBALLA DIVISION.														
7	Umballa	1,251	1,117	1,278	1,616	2,195	2,313	1,502	1,858	2,385	4,709	5,886	3,536	29,646	7
8	Ludhiána	1,062	898	926	993	1,599	1,450	1,157	1,487	2,596	5,422	6,131	2,461	26,182	8
9	Simla	66	35	37	52	77	65	51	59	80	67	53	63	705	9
	JULLUNDUR DIVISION.														
10	Jullundur	1,481	1,331	1,265	1,306	1,918	2,125	1,729	2,327	6,523	16,569	12,814	6,952	56,340	10
11	Hoshiárpur	1,673	1,546	1,588	1,444	2,776	2,060	1,681	2,147	3,403	8,537	5,921	3,253	36,029	11
12	Kangra	1,402	1,241	1,320	1,055	1,448	1,655	1,104	1,195	1,541	1,720	1,600	1,373	16,654	12
	AMRITSAR DIVISION.														
13	Amritsar	2,122	1,748	1,645	1,658	2,959	2,585	2,190	1,839	3,470	6,077	6,340	4,759	37,392	13
14	Gurdáspur	1,905	1,832	1,918	1,531	2,738	1,949	1,486	1,322	1,842	3,446	3,348	2,925	26,242	14
15	Siálkot	1,799	1,585	1,776	1,725	2,716	1,730	1,328	1,001	1,779	2,968	2,648	2,066	23,121	15
	LAHORE DIVISION.														
16	Lahore	2,070	1,879	1,750	1,766	2,687	2,552	2,183	2,122	3,207	5,506	5,472	4,439	35,633	16
17	Gujránwála	1,219	1,036	938	1,079	1,885	1,416	1,088	949	1,365	2,519	2,853	2,319	18,666	17
18	Ferozepore	790	650	700	811	974	982	845	1,083	3,907	6,450	3,813	1,819	22,824	18
	RAWALPINDI DIVISION.														
19	Rawalpindi	1,524	1,173	1,168	1,345	2,322	2,251	1,773	1,539	1,849	2,765	4,138	4,188	26,035	19
20	Jhelum	997	667	674	856	1,301	1,022	861	876	1,430	1,898	2,415	1,824	14,821	20
21	Gujrat	884	776	1,022	1,115	1,700	1,826	1,126	1,194	1,339	1,698	2,866	2,162	17,708	21
22	Shahpur	952	598	645	748	1,094	771	632	577	935	1,350	1,740	1,239	11,281	22
	MOOLTAN DIVISION.														
23	Mooltan	1,067	948	919	781	906	933	833	770	982	1,123	1,927	1,594	12,783	23
24	Jhang	453	319	292	235	322	330	305	239	326	316	455	708	4,300	24
25	Montgomery	765	750	854	918	1,085	875	734	653	734	1,180	1,270	1,166	10,984	25
26	Muzaffargarh	664	513	490	541	739	581	620	368	721	1,310	1,591	1,088	9,226	26
	DERAJAT DIVISION.														
27	Dera Ismail Khan	678	630	702	641	755	610	472	532	866	1,478	2,172	1,194	10,730	27
28	Dera Gházi Khan	333	327	374	318	365	436	408	260	397	630	985	792	5,625	28
29	Bannu	420	370	427	397	401	303	317	275	559	924	987	821	6,201	29
	PESHAWAR DIVISION.														
30	Pshawár	583	503	494	580	903	1,105	695	643	672	1,989	2,805	1,843	12,815	30
31	Hazára	421	456	761	1,276	1,128	944	938	731	552	531	705	910	9,353	31
32	Kohát	80	73	61	60	77	70	60	68	135	209	257	421	1,571	32
	Total for the Province ...	34,107	29,710	32,212	34,292	47,596	44,014	33,336	34,476	57,266	105,802	107,272	68,688	628,771	
	Ratio of deaths per 1,000 in each month	23·40	20·39	22·10	23·53	32·66	30·20	22·87	23·66	39·30	72·60	73·61	47·13	35·96	

DEATHS REGISTERED according to age in the DISTRICTS of the PUNJAB during the year 1878.

1	2	3		4		5		6		7		8		9		10		11		12
Number.	DISTRICTS.	*Under 1 year.*		*1 year and under 6.*		*6 and under 12.*		*12 and under 20.*		*20 and under 30.*		*30 and under 40.*		*40 and under 50.*		*50 and under 60.*		*60 and upwards.*		Number.
		Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	
	DELHI DIVISION.																			
1	Delhi	3,494	3,075	4,722	4,005	951	774	502	549	909	1,052	933	947	1,352	1,041	1,486	1,147	3,517	3,295	1
2	Gurgaon	2,440	2,009	6,426	4,788	1,554	1,129	1,970	760	2,039	1,639	1,903	1,721	2,409	1,858	2,740	2,226	5,767	4,728	2
3	Karnal	2,810	2,037	4,021	3,225	710	580	411	327	788	661	853	685	1,210	863	1,301	901	3,001	2,456	3
	HISSAR DIVISION.																			
4	Hissar..	735	558	1,493	1,007	263	252	263	191	434	489	468	428	655	477	760	455	1,567	1,378	4
5	Rohtak	1,445	1,121	2,627	2,059	666	427	386	310	605	609	606	618	969	724	1,189	823	2,697	2,297	5
6	Sirsa	441	425	745	703	160	148	123	109	221	196	188	156	266	272	270	182	615	521	6
	UMBALLA DIVISION.																			
7	Umballa	2,519	2,100	3,333	2,798	763	635	473	371	1,003	835	1,275	887	1,596	1,047	1,551	1,006	4,117	3,237	7
8	Ludhianah	2,649	2,280	2,827	2,648	579	479	417	362	748	800	740	717	1,202	941	1,328	874	3,592	2,931	8
9	Simla	66	41	13	20	9	7	22	19	65	29	66	25	70	21	41	23	98	60	9
	JULLUNDUR DIVISION.																			
10	Jullundur	4,731	4,762	6,491	6,649	1,385	1,372	888	757	1,392	1,472	1,829	1,628	2,637	1,853	3,222	2,401	6,869	6,101	10
11	Hoshiarpur	3,706	3,687	3,221	3,381	854	865	555	538	1,000	1,039	1,287	1,117	1,795	1,197	1,843	1,264	4,568	4,092	11
12	Kangra	1,240	1,187	803	768	411	299	491	437	829	962	803	625	1,244	813	932	522	2,359	1,816	12
	AMRITSAR DIVISION.																			
13	Amritsar	4,166	3,881	3,910	3,517	1,017	862	652	654	1,231	1,197	1,423	999	1,809	1,086	1,700	1,116	4,714	3,458	13
14	Gurdaspur	2,154	2,071	2,218	2,749	656	606	503	459	952	887	1,245	828	1,797	1,105	1,574	955	3,475	2,608	14
15	Sialkot	2,230	1,936	1,969	1,831	534	483	393	368	686	516	860	563	1,396	769	1,273	704	2,927	2,692	15
	LAHORE DIVISION.																			
16	Lahore	4,891	4,269	4,621	3,989	907	814	560	609	837	972	1,005	863	1,466	984	1,417	827	3,676	2,820	16
17	Gujranwala	2,473	2,212	1,950	1,941	511	538	255	289	363	364	475	403	729	493	751	488	2,524	1,910	17
18	Ferozepore	1,763	1,606	2,277	1,911	613	527	512	465	814	835	908	793	1,219	777	1,504	810	3,360	2,130	18
	RAWALPINDI DIVISION.																			
19	Rawalpindi	2,693	2,322	3,045	2,931	883	823	635	592	950	824	1,129	931	1,285	919	1,040	624	2,525	1,941	19
20	Jhelum	1,479	1,293	1,546	1,549	459	427	301	304	419	522	463	461	598	496	667	440	1,759	1,638	20
21	Gujrat	1,504	1,262	2,415	2,082	539	483	299	311	437	414	545	430	767	568	787	487	2,395	1,977	21
22	Shahpur	1,709	1,283	1,227	1,187	353	316	134	163	200	197	225	210	342	245	431	305	1,496	1,261	22
	MOOLTAN DIVISION.																			
23	Mooltan	1,361	1,135	1,057	917	435	356	230	206	443	424	550	476	839	520	625	374	1,667	1,190	23
24	Jhang..	406	385	349	322	106	83	75	61	105	93	149	129	216	145	262	179	730	503	24
25	Montgomery	1,303	1,220	1,676	1,512	401	346	172	149	199	237	232	237	357	281	378	252	1,167	864	25
26	Muzaffargarh	858	710	887	739	314	276	178	134	288	294	417	376	515	396	491	272	1,240	931	26
	DERAJAT DIVISION.																			
27	Dera Ismail Khan	1,206	988	1,249	1,159	297	226	186	156	317	279	402	373	531	359	488	340	1,194	968	27
28	Dera Ghazi Khan	399	312	566	496	252	146	126	121	193	219	303	267	327	217	303	193	678	495	28
29	Bannu	611	419	768	769	208	168	126	84	184	143	228	206	312	231	301	190	667	584	29
	PESHAWAR DIVISION.																			
30	Peshawar	740	642	1,853	1,767	424	307	248	274	523	441	645	492	744	520	571	356	1,362	906	30
31	Hazara	261	192	694	625	557	418	345	241	467	328	744	433	762	427	517	247	1,351	744	31
32	Kohat	67	59	172	111	66	44	34	25	86	64	116	73	119	72	115	65	156	123	32
	Total for the Province ..	58,541	51,691	71,167	63,755	17,943	15,289	11,575	10,406	19,747	19,057	23,017	19,103	31,283	21,708	31,768	21,050	78,814	62,753	
	Ratio per 1,000 living ..	6·15	6·48	7·48	7·99	1·89	1·92	1·22	1·30	2·08	2·39	2·42	2·39	3·30	2·72	3·34	2·64	8·29	7·87	

ANNUAL FORM No. V.

DEATHS REGISTERED according to CLASSES in the DISTRICTS of the PUNJAB, during the year 1878.

1	2	3					4					5				
Number.	Districts.	Population according to Census of 1868.					Number of Deaths registered.					Ratio of Deaths per 1,000 of Population.				
		Muhammadans.	Hindus.	Native Christians.	Other castes.	Total.	Muhammadans.	Hindus.	Native Christians.	Other castes.	Total.	Muhammadans.	Hindus.	Native Christians.	Other castes.	Total.
	DELHI DIVISION.															
1	Delhi						8,761	21,599	24	3,356	33,740					
2	Gurgaon						16,459	22,719	...	8,128	47,306					
3	Karnál						6,887	16,512	...	3,530	26,929					
	HISSAR DIVISION.															
4	Hissar						2,558	8,275	...	1,249	12,082					
5	Rohtak						3,037	14,884	...	2,257	20,178					
6	Sirsa						1,830	3,205	...	634	5,669					
	UMBALLA DIVISION.															
7	Umballa						9,035	16,502	2	4,107	29,646					
8	Ludhiána						10,705	13,149	2	2,326	26,182					
9	Simla						211	319	...	175	705					
	JULLUNDUR DIVISION.															
10	Jullundur						25,008	25,011	...	6,321	56,340					
11	Hoshiárpur	Information not available.					12,870	18,428	...	4,731	36,029	Information not available.				
12	Kangra						1,390	12,663	1	2,600	16,654					
	AMRITSAR DIVISION.															
13	Amritsar						18,483	15,658	1	3,250	37,392					
14	Gurdáspur						13,569	9,458	...	3,215	26,242					
15	Siálkot						14,862	5,496	1	2,762	23,121					
	LAHORE DIVISION.															
16	Lahore						22,696	9,940	5	2,992	35,633					
17	Gujránwála						13,048	4,465	1	1,152	18,666					
18	Ferozepore						11,031	9,948	...	1,845	22,824					
	RAWALPINDI DIVISION.															
19	Rawalpindi						23,150	2,766	3	116	26,035					
20	Jhelum						12,686	1,997	...	138	14,821					
21	Gujrat						15,576	2,046	...	86	17,708					
22	Shahpur						9,125	1,977	...	179	11,281					
	MOOLTAN DIVISION.															
23	Mooltan						9,726	2,850	2	205	~~12,783~~					
24	Jhang						3,002	1,177	...	121	4,300					
25	Montgomery						7,509	2,891	...	584	10,984					
26	Muzaffargarh						7,853	1,290	...	83	9,226					
	DERAJAT DIVISION.															
27	Dera Ismail Khan						9,077	1,566	...	87	10,730					
28	Dera Gházi Khan						4,439	1,148	...	38	5,625					
29	Bannu						5,485	674	2	40	6,201					
	PESHAWAR DIVISION.															
30	Peshawar						11,820	859	2	134	12,815					
31	Hazára						8,949	395	...	9	9,353					
32	Kohát						1,428	111	...	32	1,571					
	Total of the province ...						322,265	249,978	46	56,482	628,771					

DEATHS REGISTERED from different CAUSES in the DISTRICTS

1	2	3	4	5	6	7		
Number.	A. DISTRICTS.	Population according to Census of 1868.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries. Suicide. Males.	Females.
	DELHI DIVISION.							
1	Delhi ...	434,660	15	675	13,130	1,164	2	5
2	Gurgaon ...	636,779	78	6,212	29,395	2,521	16	20
3	Karnál ...	546,613	...	3,772	14,620	1,072	3	9
	HISSAR DIVISION.							
4	Hissar ...	425,089	...	402	7,107	369	...	2
5	Rohtak ...	509,509	...	883	14,643	1,034	4	1
6	Sirsa ...	197,988	...	304	3,263	257	...	...
	UMBALLA DIVISION.							
7	Umballa ...	936,992	...	1,744	17,455	2,328	1	4
8	Ludhiána ...	526,539	...	437	15,258	721	2	4
9	Simla ...	16,154	...	1	122	72	...	...
	JULLUNDUR DIVISION.							
10	Jullundur ...	708,129	...	111	44,010	575	6	8
11	Hoshiárpur ...	911,781	...	352	24,900	2,687	8	16
12	Kangra ...	740,896	1	226	10,166	1,378	10	28
	AMRITSAR DIVISION.							
13	Amritsar ...	696,584	...	2 511	18,672	869	7	6
14	Gurdáspur ...	876,942	1	812	18,284	1,287	7	8
15	Siálkot ...	961,469	2	674	15,912	901	6	5
	LAHORE DIVISION.							
16	Lahore ...	630,317	1	2,902	18,464	548	4	6
17	Gujránwála ...	514,868	1	1,409	12,511	421	5	4
18	Ferozepur ...	518,248	...	563	18,180	382	6	4
	RAWALPINDI DIVISION.							
19	Rawalpindi ...	670,906	...	1,174	17,640	594	1	1
20	Jhelum ...	485,591	...	129	9,866	545	...	2
21	Gujrat ...	584,952	...	1,843	10,675	728	3	2
22	Shahpur ...	354,086	...	615	6,328	505	...	...
	MOOLTAN DIVISION.							
23	Mooltan ...	408,887	...	1,420	7,118	283	1	...
24	Jhang ...	322,410	...	199	2,135	151	...	...
25	Montgomery ...	359,437	...	3,086	5,810	161	2	...
26	Muzaffargarh ...	295,547	...	1,007	7,218	78	...	...
	DERAJAT DIVSION.							
27	Dera Ismail Khan ...	369,579	...	290	7,521	216	1	4
28	Dera Gházi Khan ...	286,770	...	576	3,364	80	...	2
29	Banuú ...	284,323	...	318	4,509	348	...	...
	PESHAWAR DIVISION.							
30	Pesháwar ...	440,049	...	671	5,468	209	1	...
31	Hazárá ...	364.324	...	599	6,760	745	2	...
32	Kohát ...	129,166	...	19	1,128	13	...	...
	Total of Districts ...	16,145,564	99	35,936	391,632	23,233	98	141

NOTE—A. Districts in this statement do not include

and TOWNS of the PUNJAB during the year 1878.

8			9	10	11								12
RIES.					RATIO OF DEATHS PER 1,000 OF POPULATION.								
Wounding or accidents.	Snake bite or killed by wild beasts.	Total.	All other causes.	Total deaths from all causes.	Cholera.	Small-pox.	Fevers.	Bowel Complaint.	Injuries.	All other causes.	*From all causes.* For the year.	*From all causes.* Mean of previous five years	Number.
145	12	164	4,018	19,166	0·03	1·55	30·21	2·68	0·38	9·24	44	22	1
343	10	389	2,852	41,447	0·12	9·75	46·16	3·96	0·61	4·32	65	17	2
150	37	199	3,943	23,606	...	6·90	26·75	1·96	0·36	7·21	43	19	3
81	13	96	733	8,707	...	0·94	16·72	0·87	0·22	1·72	20	11	4
174	17	196	2,145	18,901	...	1·73	28·74	2·03	0·38	4·21	37	17	5
32	16	48	823	4,695	...	1·53	16·48	1·30	0·24	4·16	24	17	6
162	21	188	4,998	26,713	...	1·86	18·63	2·48	0·20	5·33	28	19	7
76	7	89	4,061	20,566	...	0·83	28·98	1·37	0·17	7·71	39	21	8
8	3	11	149	355	...	0·06	7·55	4·46	0·68	9·22	22	17	9
135	6	155	5,515	50,366	...	0·16	62·15	0·81	0·22	7·79	71	31	10
272	32	328	6,401	34,668	...	0·39	27·31	2·95	0·36	7·02	38	30	11
299	54	391	4,397	16,559	0·001	0·30	13·72	1·86	0·53	5·93	22	21	12
168	14	195	5,386	27,633	...	3·60	26·80	1·25	0·28	7·73	40	26	13
196	22	233	4,958	25,575	0·001	0·92	20·85	1·47	0·26	5·65	29	27	14
138	15	164	4,535	22,188	0·002	0·70	16·55	0·94	0·17	4·72	23	25	15
122	84	216	6,225	28,356	...	4·60	29·29	0·87	0·34	9·87	45	29	16
118	70	197	2,866	17,405	...	2·74	24·30	0 82	0·39	5·57	34	24	17
99	21	130	2,233	21,488	...	1·09	35·08	0·74	0·25	4·31	41	17	18
264	42	308	4,197	23,913	...	1·75	26·29	0·88	0·46	6·25	36	18	19
140	36	178	3,132	13,850	...	0·26	20·32	1·12	0 37	6·44	28	20	20
130	24	159	2,908	16,313	...	3·15	18·25	1·24	0·27	4·97	28	17	21
83	42	125	2,921	10,494	...	1·74	17·87	1·43	0·35	8·25	30	23	22
129	36	166	1,449	10,436	...	3·47	17·41	0·69	0·40	3 54	25	22	23
58	29	87	866	3,438	...	0·62	6·62	0·47	0·27	2·69	11	15	24
97	42	141	1,786	10,984	...	8·58	16·16	0·45	0·39	4·97	30	23	25
105	43	148	775	9,226	...	3·41	24·43	0·26	0·50	2·62	31	19	26
84	33	122	1,388	9.537	...	0·78	20·35	0·58	0·33	3·75	26	19	27
33	16	51	426	4,497	...	2·01	11·73	0·28	0·18	1·48	16	11	28
58	9	67	894	6,136	...	1·12	15·86	1·22	0.23	3·14	21	14	29
61	4	66	739	7,144	...	1·52	12·42	0 45	0·15	1·68	16	8	30
202	2	206	1,016	9,326	...	1·64	18·55	2·04	0·56	2·79	25	14	31
27	3	30	71	1,261	...	0·15	8·73	0·10	0·23	0·55	10	7	32
4,189	815	5,243	88,806	5,44,949	0.01	2·22	24·26	1·44	0·32	5·50	34	21	

the population and deaths of the principal Towns, Cantonments and Hill Sanitaria,

ANNUAL FORM No.

DEATHS REGISTERED from different CAUSES in the

1	2	3	4	5	6	7		
Number.	B. Towns.	Population according to Census of 1875-76.	Cholera.	Small-pox.	Fever.	Bowel Complaints.	Injury. Suicide. Males.	Injury. Suicide. Females.
	DELHI DISTRICT.							
1	Delhi	115,992	12	113	7,365	601	4	1
2	Do. Suburbs	44,561	17	11	2,054	277	...	...
3	Sonepat	13,637	...	46	180	37	1	...
	GURGAON DISTRICT.							
4	Farkhnagar	10,594	30	115	207	141	...	...
5	Rewári	25,190	49	418	520	359	...	...
6	Firozpur	10,530	...	71	639	248	...	...
7	Palwal	13,553	6	103	1,015	559	...	...
	KARNAL DISTRICT.							
8	Karnál	24,015	...	109	935	195	...	...
9	Kaithal	15,799	...	91	449	163	1	...
10	Panipat	24,500	...	34	488	79	...	...
	HISSAR DISTRICT.							
11	Hissar	14,162	...	58	659	176	...	.
12	Hánsi	12,210	...	69	554	27	1	...
13	Bhiwáni	33,220	...	150	572	164	...	...
	ROHTAK DISTRICT.							
14	Rohtak	14,994	...	6	504	124	...	...
15	Jhajjar	12,456	...	28	193	60	...	...
	SIRSA DISTRICT.							
16	Sirsa	12,807	...	8	574	110	...	...
	UMBALLA DISTRICT.							
17	Umballa	26,258	...	102	661	363	...	...
18	Jagádhri	12,522	...	1	173	49	...	...
19	Shahabad	11,660	...	116	145	19	1	...
20	Sádhaura	11,167	1	74	210	6	...	...
21	Rúpar	10,261	...	5	158	7	...	1
	LUDHIANA DISTRICT.							
22	Ludhiána	40,385	...	234	2,745	620	...	...
23	Jagraon	16,321	...	25	543	184	...	...
	JULLUNDUR DISTRICT.							
24	Jullundur	35,222	...	28	2,505	184	1	...
25	Do. Suburbs	15,702	...	...	1,490	17	...	...
26	Kartárpur	11,053	...	4	324	23	...	...
27	Ráhon	12,914	...	4	382	55	...	...
	HOSHIARPUR DISTRICT.							
28	Hosiárpur	13,138	...	30	340	159	1	...
29	Urmar Tánda	13,971	...	...	335	93	...	...
	AMRITSAR DISTRICT.							
30	Amritsar	136,166	...	446	5,384	986	7	3
	GURDASPUR DISTRICT.							
31	Batála	26,929	...	68	315	47	...	...
	SIALKOT DISTRICT.							
32	Siálkot	32,989	...	15	349	168	...	...
	LAHORE DISTRICT.							
33	Lahore	92,035	...	456	3,863	68	...	...
34	Do. Suburbs	36,406	...	57	792	231	3	...
35	Kasur	16,793	...	19	389	26	...	..
	GUJRANWALLA DISTRICT.							
36	Gujránwála	20,362	...	146	400	105	...	...
37	Wazirabad	15,346	1	3	217	14	...	...
	FEROZEPORE DISTRICT.							
38	Ferozepore	15,168	...	19	913	118	...	...
	RAWALPINDI DISTRICT.							
39	Rawalpindi	20,802	...	116	1,031	308	...	...
	JHELUM DISTRICT.							
40	Pind Dádan Khan	15,397	...	52	518	230	...	...
	GUJRAT DISTRICT.							
41	Gujrat	17,401	...	130	377	4	...	..
42	Jalálpur	14,014	...	146	350	45	...	...
	SHAHPUR DISTRICT.							
43	Bhera	14,710	...	58	397	105	...	...
	MOOLTAN DISTRICT.							
44	Mooltan	29,448	...	174	468	112	1	...
45	Do. Suburbs	21,439	...	45	579	83	...	1
	JHANG DISTRICT.							
46	Maghiána	13,618	...	166	169	14	...	...
47	Chiniot	11,999	...	2	96	34	...	...
	DERA ISMAIL KHAN DISTRICT.							
48	Dera Ismail Khan	19,954	...	24	762	137	...	...
	DERA GHAZI KHAN DISTRICT.							
49	Dera Gházi Khan	19,133	...	35	584	157	...	...
	PESHAWAR DISTRICT.							
50	Pesháwar	58,430	...	79	3,419	569	...	...
	KOHAT DISTRICT.							
51	Kohát	11,043	...	1	138	10	...	...
	Total of the Towns ...	1,288,367	116	4,330	48,429	8,670	21	6
	Total for the Province ...	17,487,125	215	40,271	4,40,492	32,071	121	147

DISTRICTS and TOWNS of the PUNJAB during the year 1878.

8			9	10	11								12
DIES.					RATIO OF DEATHS PER 1,000 OF POPULATION.								
Wounding or accident.	Snake bite or killed by wild beasts.	Total.	All other causes.	Total deaths from all causes.	Cholera	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	All other causes.	*From all Causes.* For the year.	*From all Causes.* Mean of previous five years.	Number.
43	3	51	3,165	11,307	0·10	0·97	63·49	5·18	0·44	27·29	97	50	1
8	5	13	553	2,925	0·38	0·25	46·09	6·22	0·29	12·41	66	36	2
5	...	6	73	342	...	3·37	13·20	2·64	0·44	5·35	25	31	3
1	...	1	163	657	2·83	10·85	19·54	13·31	0·09	15·39	62	39	4
4	...	4	384	1,734	1·94	16·59	20·64	14·25	0·16	15·24	69	44	5
7	...	7	209	1,174	...	6·74	60·68	23·55	0·66	19·85	111	42	6
12	...	12	599	2,294	0·44	7·60	74·89	41·25	0·88	44·20	169	46	7
4	1	5	360	1,604	...	4·54	38·93	8·12	0·21	14·99	67	40	8
6	1	8	92	803	...	5·76	28·42	10·32	0·51	5·82	51	19	9
5	1	6	309	916	...	1·39	19·92	3·22	0·24	12·61	37	37	10
1	2	3	248	1,144	...	4·09	46·53	12·43	0·21	17·51	81	35	11
5	1	7	89	746	...	5·65	45·37	2·21	0·57	7·29	61	31	12
15	...	15	584	1,485	...	4·51	17·22	4·94	0·45	17·58	45	34	13
2	...	2	209	845	...	0·40	33·61	8·27	0·13	13·93	56	31	14
2	...	2	149	432	...	2·25	15·49	4·82	0·16	11·96	35	25	15
8	...	8	274	974	...	0·62	44·82	8·60	0·62	21·39	76	33	16
5	1	6	388	1,520	...	3·88	25·17	13·82	0·23	14·78	58	35	17
3	...	3	178	404	...	0·08	13·81	3·91	0·24	14·21	32	28	18
...	1	2	86	368	...	9·95	12·43	1·63	0·17	7·37	31	25	19
2	...	2	100	393	0·09	6·63	18·80	0·54	0·18	8·95	35	33	20
1	2	4	74	248	...	0·49	15·40	0·68	0·39	7·21	24	32	21
11	1	12	895	4,506	...	5·79	67·97	15·35	0·30	22·16	111	33	22
2	1	3	355	1,110	...	1·53	33·27	11·27	0·18	21·75	68	38	23
3	...	4	579	3,300	...	0·79	71·12	5·22	0·11	16·44	94	55	24
5	...	5	173	1,685	...	...	94·89	1·08	0·32	11·02	107	49	25
...	...	...	66	417	...	0·36	29·31	2·08	...	5·97	38	54	26
1	...	1	130	572	...	0·31	29·58	4·26	0·08	10·07	44	25	27
7	1	9	226	764	...	2·27	25·88	12·10	0·68	17·20	58	43	28
2	...	2	167	597	...	...	23·98	6·66	0·14	11·95	43	52	29
70	6	86	2,857	9,759	...	3·27	39·54	7·24	0·63	20·98	72	52	30
6	...	6	187	643	...	3·27	11·70	1·74	0·22	6·94	24	35	31
8	1	9	392	933	...	0·45	10·58	5·09	0·27	11·88	28	39	32
43	2	45	869	5,301	...	4·95	41·97	0·74	0·49	9·44	57	37	33
9	1	13	322	1,415	...	1·56	21·75	6·34	0·36	8·84	39	21	34
4	1	5	122	561	...	1·13	23·16	1·55	0·30	7·26	33	30	35
4	...	4	291	946	...	7·17	19·64	5·16	0·20	14·29	46	38	36
5	1	6	74	315	0·06	0·19	14·14	0·91	0·39	4·82	20	35	37
1	4	5	281	1,336	...	1·25	60·17	7·78	0·33	18·52	88	42	38
21	2	23	462	1,940	...	5·58	49·56	14·81	1·10	22·21	93	40	39
1	...	1	170	971	...	3·38	33·64	14·94	0·06	11·06	63	31	40
13	...	13	114	638	...	7·47	21·66	0·23	0·75	6·55	37	32	41
6	...	6	210	757	...	10·42	24·97	3·21	0·43	14·98	54	31	42
1	...	1	226	787	...	3·94	26·99	7·14	0·07	15·36	53	34	43
7	...	8	482	1,244	...	5·91	15·89	3·80	0·27	16·37	42	33	44
9	2	12	384	1,103	...	2·10	27·02	3·87	0·56	17·92	51	46	45
3	2	5	158	512	...	12·19	12·41	1·03	0·37	11·60	37	24	46
8	3	11	207	350	...	0·17	8·00	2·83	0·92	17·25	29	27	47
1	...	1	209	1,133	...	1·20	38·19	6·87	0·05	10·47	51	24	48
6	1	7	277	1,060	...	1·83	30·52	8·20	0·36	14·48	55	31	49
35	3	38	1,516	5,621	...	1·35	58·51	9·74	0·65	25·94	96	37	50
6	1	7	55	211	...	0·09	12·50	0·90	0·63	4·98	20	19	51
437	51	515	20,742	82,802	0·09	3·36	37·59	6·73	0·40	16·10	64	36	
4,649	866	5,783	109,939	628,771	0·01	2·30	25·19	1·83	0·33	6·29	36	22	

Note.—The deaths registered in the Frontier Cantonments and Hill Sanitaria, are shown separately in Form No. VI. B. but are included in the Grand Total for the Province.

DEATHS REGISTERED IN THE FRONTIER CANTONMENTS AND HILL SANITARIA DURING THE YEAR 1878.

Number.	Frontier Cantonments and Hill Sanitaria.	Population.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.					All other causes.	Total deaths from all causes.	Ratio of deaths per 1,000 of population.	Total births registered during the year.	Ratio of births per 1,000 of population.
							Suicide.		Wounds or accidents.	Snake-bite or killed by wild beasts.	Total.					
							Males.	Females.								
	Frontier Cantonments.															
1	Abbott-abad ...	2,894	...	...	6	4	...	...	2	...	2	15	27	9	21	7
2	Mardán ...	1,964	...	..	18	9	...	...	1	...	1	22	50	25	44	22
3	Kohát ...	5,210	...	...	20	29	1	...	1	...	2	48	99	19	28	5
4	Edwardes-abad ...	3,224	...	...	27	12	...	...	1	...	1	25	65	20	38	12
5	Dera Ismail Khan ...	5,331	...	...	19	13	...	...	...	...	...	28	60	11	16	3
6	Dera Gházi Khan ...	2,937	...	...	31	6	...	...	...	...	...	19	56	19	13	4
7	Rájanpur ...	1,138	...	...	1	1	...	...	...	...	...	10	12	10	7	6
	Hill Sanitaria.															
1	Simla ...	17,440	...	1	148	51	...	...	8	...	8	142	350	20	88	5
2	Dharamsála ...	2,862	...	1	24	29	...	...	2	...	2	39	95	33	45	16
3	Dalhousie ...	2,255	...	...	13	2	...	...	3	...	3	6	24	11	5	2
4	Murree ...	7,939	...	3	124	12	1	...	5	...	6	37	182	23	17	2
	TOTAL ...	53,194	...	5	431	168	2	...	23	...	25	391	1,020	19	322	6

ANNUAL FORM No. VII.

DEATHS registered from CHOLERA in the DISTRICTS of the Punjab during each month of the year 1878.

1	2	3		4		5												6			7			8	9
Number.	Districts.	Circles of registration.		Villages.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.			Ratio of deaths per 1,000 of population.			Mean ratio per 1,000 of previous 5 years.	
		Numbers in each district.	Numbers from which deaths from Cholera were reported.	Number in each district.	Numbers from which deaths from Cholera were reported.													Males.	Females.	Total.	Males.	Females.	Total.		
	DELHI DIVISION.																								
1	Delhi ..	15	3	743	3	...	...	...	...	...	2	16	15	4	7	...	...	22	12	44	0·10	0·04	0·07	0·10	1
2	Gurgaon ..	16	6	1,239	10	...	...	...	...	...	...	16	54	66	...	27	...	93	68	163	0·26	0·21	0·23	0·18	2
3	Karnál ..	14	...	868	...	..	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	0·27	3
	HISSAR DIVISION.																								
4	Hissar ...	12	...	713	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·38	4
5	Rohtak ...	11	...	498	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·35	5
6	Sirsa ...	13	...	626	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	0·30	6
	UMBALLA DIVN.																								
7	Umballa ..	20	1	2,225	1	...	...	...	...	..	...	...	1	...	...	...	...	1	...	1	0·001	...	0·001	0·72	7
8	Ludhiána ..	9	..	851	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	0·30	8
9	Simla ...	4	...	238	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	0·35	9
	JULLUNDUR DIVN.																								
10	Jullundur ...	9	...	1,235	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	0·02	10
11	Hoshiárpur ...	14	...	2,178	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·30	11
12	Kángra ..	15	1	704	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	0·002	...	0·001	0·19	12
	AMRITSAR DIVN.																								
13	Amritsar ..	10	...	1,078	...	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	0·31	13
14	Gurdáspur ...	17	1	2,202	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	0·002	...	0·001	0·33	14
15	Siálkot ..	13	2	2,315	2	...	2	...	...	...	...	...	...	...	...	...	...	2	...	2	0·003	...	0·002	0·15	15
	LAHORE DIVISION.																								
16	Lahore ...	20	1	1,672	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	0·002	0·001	0·27	16
17	Gujránwála ..	9	1	1,177	2	...	1	...	...	...	...	...	...	...	1	...	...	2	...	2	0·006	...	0·003	0·10	17
18	Ferozepore ..	15	...	1,276	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	18
	RAWALPINDI DIVN.																								
19	Rawalpindi ..	18	..	1,725	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·18	19
20	Jhelum ...	12	...	1,042	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·12	20
21	Gujrat ...	8	...	1,416	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·19	21
22	Shahpur ...	15	...	632	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·27	22
	MOOLTAN DIVN.																								
23	Mooltan ...	13	...	1,733	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	0·01	23
24	Jhang ...	9	...	976	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24
25	Montgomery ...	16	...	1,518	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25
26	Muzaffargarh ...	12	...	534	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26
	DERAJAT DIVISION.																								
27	Dera Ismail Khan ...	19	...	772	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·12	27
28	Dera Gházi Khan ...	17	...	422	...	...	...	..	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	0·06	28
29	Bannu ...	12	...	553	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·69	29
	PESHAWAR DIVN.																								
30	Peshawar ...	19	...	730	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·25	30
31	Hazara ...	16	...	1,013	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·13	31
32	Kohát ...	5	...	454	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	0·3	32
	Total for the Province ...	427	16	34,358	21	1	4	...	...	...	2	32	70	70	8	27	1	134	81	215	0·01	0·01	0·01	0·14	

DEATHS REGISTERED from SMALL-POX in the DISTRICTS

1	2	3		4		5						
Number.	Districts.	*Circles of registration.*		*Villages.*		January.	February.	March.	April.	May.	June.	July.
		Number in each district.	No. from which deaths from small-pox were reported.	Number in each district.	No. from which deaths from small-pox were reported.							
	DELHI DIVISION.											
1	Delhi	15	14	743	156	168	134	152	194	148	45	3
2	Gurgaon	16	16	1,239	802	395	766	1,407	1,920	1,475	695	179
3	Karnál	14	14	868	472	203	279	404	549	1,088	681	346
	HISSAR DIVISION.											
4	Hissar	12	12	715	117	228	136	86	84	70	22	16
5	Rohtak	11	10	498	134	266	199	153	144	103	41	10
6	Sirsa	13	13	626	123	15	45	66	64	45	30	21
	UMBALLA DIVISION.											
7	Umballa	20	20	2,225	528	32	45	50	128	296	453	263
8	Ludhiána	9	9	851	133	27	37	49	60	111	142	84
9	Simla	4	1	238	1	...	...	1	...	1	...	...
	JULLUNDUR DIVISION.											
10	Jullundur	9	9	1,233	46	2	2	3	9	23	28	21
11	Hoshiárpur	14	12	2,178	96	3	3	7	17	60	72	81
12	Kángra	15	14	704	73	3	5	...	9	30	94	34
	AMRITSAR DIVISION.											
13	Amritsar	10	10	1,078	316	205	179	169	249	598	487	473
14	Gurdáspur	17	17	2,302	238	14	15	21	39	152	162	140
15	Siálkot	13	13	2,315	174	9	5	7	21	76	74	130
	LAHORE DIVISION.											
16	Lahore	20	20	1,672	593	75	99	133	251	499	558	564
17	Gujránwála	9	9	1,177	328	6	15	22	73	132	191	193
18	Ferozepore	15	15	1,276	149	12	14	25	61	100	82	61
	RAWALPINDI DIVISION.											
19	Rawalpindi	18	18	1,725	355	54	41	43	55	72	95	122
20	Jhelum	12	10	1,042	43	8	5	15	5	17	9	12
21	Gujrat	8	8	1,416	268	6	11	9	26	84	107	150
22	Shahpur	15	15	632	136	70	46	54	85	92	52	34
	MOOLTAN DIVISION.											
23	Mooltan	13	13	1,233	277	91	134	186	185	194	212	144
24	Jhang	9	8	976	54	2	4	7	9	32	17	34
25	Montgomery	16	16	1,518	549	103	181	291	411	549	454	355
26	Muzaffargarh	12	12	534	226	67	75	72	115	171	160	179
	DERAJAT DIVISION.											
27	Dera Ismail Khan	19	17	772	96	27	30	26	50	69	31	25
28	Dera Gházi Khan	17	16	422	90	38	31	34	32	46	72	81
29	Bannu	12	12	553	96	53	61	36	26	33	39	30
	PESHAWAR DIVISION.											
30	Peshawar	19	18	730	145	38	25	29	40	98	121	64
31	Hazárá	16	13	1,013	123	9	2	6	11	15	14	27
32	Kohát	5	5	454	14	2	2	2	5	4	3	1
	Total for the Province ...	427	409	34,958	6,951	2,231	2,626	3,565	4,927	6,483	5,243	3,877

of the PUNJAB during each month of the year 1878.

August.	September.	October.	November.	December.	6 Total. Males.	6 Total. Females.	6 Total. Total.	7 Number of these deaths among Children. Under one year.	7 Number of these deaths among Children. One and under 12 years.	8 Total ratio of deaths per 1000 of population. Males.	8 Total ratio of deaths per 1000 of population. Females.	8 Total ratio of deaths per 1000 of population. Total.	9 Mean ratio per 1000 of previous 5 years.	10 Number.
1	...	...	...	...	457	388	845	133	703	1·40	1·37	1·39	0·68	1
55	13	4	4	6	3,985	2,934	6,919	1,150	5,688	10·76	8·99	9·93	2·18	2
156	85	53	64	78	2,312	1,694	4,006	955	2,947	7·00	6·05	6·59	1·96	3
9	...	2	5	21	413	266	679	113	553	1·55	1·22	1·40	1·02	4
...	...	1	...	...	568	349	917	124	783	1·94	1·43	1·71	0·99	5
9	2	...	8	7	182	130	312	50	240	1·55	1·39	1·48	1·75	6
201	114	112	153	195	1,160	882	2,042	490	1,457	2·11	1·92	2·02	1·30	7
41	20	8	30	87	380	316	696	149	520	1·19	1·20	1·19	0·80	8
...	...	...	...	...	2	...	2	...	...	0·09	...	0·06	0·20	9
16	10	2	7	24	79	68	147	36	102	0·18	0·19	0·19	0·35	10
54	22	15	14	34	182	200	382	123	238	0·36	0·46	0·41	0·24	11
9	19	3	13	8	130	97	227	17	58	0·33	0·28	0·30	0·09	12
198	84	31	72	212	1,568	1,389	2,957	812	2,059	3·37	3·78	3·51	0·98	13
130	57	26	43	101	483	417	900	205	588	0·96	1·03	0·99	0·51	14
70	47	36	53	161	369	320	689	212	440	0·68	0·70	0·69	0·35	15
362	151	79	185	478	1,887	1,547	3,434	877	2,427	4·41	4·45	4·43	0·81	16
161	69	71	246	379	756	802	1,558	552	939	2·47	3·28	2·83	0·16	17
57	22	7	36	105	315	267	582	104	470	1·07	1·11	1·09	1·93	18
98	59	97	210	347	650	643	1,293	350	815	1·72	1·99	1·85	0·42	19
16	12	9	26	47	91	90	181	50	121	0·34	0·38	0·36	0·15	20
133	81	88	444	980	1,107	1,012	2,119	421	1,680	3·33	3·56	3·44	0·73	21
13	16	14	48	149	352	321	673	131	533	1·80	1·85	1·82	0·72	22
130	73	37	81	172	881	758	1,639	309	1,222	3·48	3·66	3·56	0·38	23
8	12	14	72	156	194	173	367	70	284	1·00	1·12	1·05	1·21	24
261	102	104	97	178	1,620	1,466	3,086	633	2,337	8·10	9·19	8·58	2·12	25
68	38	25	15	22	519	488	1,007	212	700	3·20	3·66	3·41	0·40	26
22	4	7	4	19	181	133	314	57	224	0·85	0·73	0·79	0·96	27
36	51	53	48	89	357	254	611	62	511	2·08	1·83	1·97	0·25	28
11	4	7	3	15	177	141	318	44	244	1·15	1·06	1·10	1·39	29
88	31	56	93	67	443	307	750	117	612	1·65	1·32	1·50	1·04	30
31	26	23	164	271	309	290	599	39	505	1·61	1·65	1·63	0·96	31
...	1	...	...	...	11	9	20	1	18	0·14	0·14	0·14	0·98	32
2,444	1,225	984	2,258	4,408	22,120	18,151	40,271	8,598	30,018	2·32	2·27	2·30	0·85	...

ANNUAL FORM

DEATHS REGISTERED from Fevers in the DISTRICTS

1	2	3		4						
		Circles of registration.		*Villages.*						
Number.	Districts.	Number in each District.	No. from which deaths from fevers were reported.	Number in each district.	Number from which deaths from fevers were reported.	January.	February.	March.	April.	May.
	DELHI DIVISION.									
1	Delhi	15	15	743	674	772	620	777	905	1,019
2	Gurgaon	16	16	1,239	1,131	863	820	975	889	1,077
3	Karnál	14	14	868	757	525	472	558	713	952
	HISSAR DIVISION.									
4	Hissar	12	12	715	609	490	410	452	438	548
5	Rohtak	11	11	498	466	729	550	581	587	640
6	Sirsa	13	13	626	503	194	184	264	247	269
	UMBALLA DIVISION.									
7	Umballa	20	20	2,225	1,905	704	559	710	834	1,039
8	Ludhiána	9	9	851	795	507	401	432	512	808
9	Simla	4	4	238	51	22	11	13	14	33
	JULLUNDUR DIVISION.									
10	Jullundur	9	9	1,233	1,170	870	719	674	803	1,234
11	Hoshiárpur	14	14	2,178	1,911	980	863	845	767	1,467
12	Kángra	15	15	704	670	798	664	726	566	818
	AMRITSAR DIVISION.									
13	Amritsar	10	10	1,078	989	999	822	763	769	1,362
14	Gurdáspur	17	17	2,302	1,971	1,290	1,285	1,354	1,014	1,777
15	Siálkot	13	13	2,315	2,179	1,183	1,037	1,166	1,203	1,703
	LAHORE DIVISION.									
16	Lahore	20	20	1,672	1,403	1,212	1,083	985	914	1,378
17	Gujránwála	9	9	1,177	1,069	795	651	611	701	1,258
18	Ferozepore	15	15	1,276	1,034	461	372	426	483	612
	RAWALPINDI DIVISION.									
19	Rawalpindi	18	18	1,725	1,506	974	754	717	845	1,477
20	Jhelum	12	12	1,042	900	552	407	387	509	746
21	Gujrat	8	8	1,416	1,278	588	503	691	728	986
22	Shahpur	15	15	632	551	498	283	325	335	525
	MOOLTAN DIVISION.									
23	Mooltan	13	13	1,233	859	690	587	530	431	520
24	Jhang	9	9	976	493	263	197	159	131	161
25	Montgomery	16	16	1,518	844	446	389	364	305	365
26	Muzaffargarh	12	12	534	449	492	368	357	347	478
	DERAJAT DIVISION.									
27	Dera Ismail Khan	19	19	772	577	491	450	516	436	524
28	Dera Gházi Khan	17	17	422	241	218	219	281	230	259
29	Bannu	12	12	553	391	240	217	262	220	290
	PESHAWAR DIVISION.									
30	Peshawar	19	19	730	464	309	292	279	345	539
31	Hazára	16	16	1,013	735	301	281	516	733	860
32	Kohát	5	5	454	159	51	48	43	36	58
	Total for the Province ...	427	427	34,958	28,734	19,507	16,518	17,739	17,990	25,722

of the PUNJAB, during each month of the year 1878.

5							6			7			8	9
							Total.			*Total ratio of deaths per 1,000, of population.*				
June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Total.	Males.	Females.	Total.	Mean ratio per 1,000 for previous five years.	Number.
1,557	868	1,030	1,903	4,749	5,745	2,784	11,707	11,022	22,729	35·88	39·01	37·33	16·98	1
2,331	1,729	2,272	4,568	7,102	6,457	2,693	17,450	14,326	31,776	47·10	43·89	45·61	10·61	2
850	652	878	1,033	2,782	4,792	2,285	8,987	7,505	16,492	27·17	26·78	26·99	11·31	3
703	465	352	1,084	1,754	1,379	817	4,875	4,017	8,892	18·27	18·44	18·35	8·68	4
1,012	592	726	1,237	3,438	3,709	1,539	8,338	7,002	15,340	28·45	28·63	28·57	14·53	5
281	222	138	369	736	559	374	1,940	1,897	3,837	16·57	20·24	18·20	10·23	6
1,126	758	1,008	1,529	3,527	4,546	2,462	10,170	8,632	18,802	18·47	18·83	18·64	11·76	7
848	639	808	1,851	4,550	5,313	1,877	9,864	8,682	18,546	30·89	32·90	31·80	12·51	8
19	16	25	40	31	25	21	185	85	270	8·36	7·41	8·04	4·78	9
1,605	1,199	1,694	5,647	15,527	12,189	6,550	25,274	23,437	48,711	58·89	66·24	62·18	22·92	10
1,202	999	1,232	2,411	7,255	4,990	2,564	13,103	12,472	25,575	25·98	28·70	27·24	19·62	11
913	636	786	1,127	1,226	1,092	838	5,536	4,654	10,190	14·07	13·28	13·70	11·98	12
1,265	1,022	921	2,555	5,004	5,142	3,432	13,165	10,891	24,056	28·31	29·62	28·89	19·64	13
1,257	918	783	1,299	2,768	2,659	2,208	10,242	8,370	18,612	20·43	20·67	20·54	19·15	14
1,101	816	576	1,325	2,436	2,158	1,557	9,258	7,003	16,261	17·18	15·36	16·35	17·54	15
1,362	1,046	1,082	2,268	4,562	4,406	3,210	12,518	10,990	23,508	29·23	31·65	30·31	19·73	16
878	607	483	990	2,143	2,334	1,677	7,000	6,128	13,128	22·85	25·09	23·84	18·42	17
675	553	757	3,549	6,110	3,537	1,558	10,831	8,262	19,093	36·89	34·45	35·79	10·48	18
1,502	1,153	934	1,324	2,218	3,484	3,413	9,916	8,879	18,795	26·32	27·49	26·83	11·99	19
621	530	500	1,044	1,547	2,049	1,492	5,248	5,136	10,384	19·83	21·73	20·73	11·47	20
1,097	649	706	997	1,380	2,075	1,002	6,124	5,278	11,402	18·45	18·56	18·50	11·52	21
387	290	277	585	1,043	1,359	818	3,455	3,270	6,725	17·43	18·90	18·23	13·20	22
527	487	399	605	768	1,480	1,141	4,595	3,570	8,165	18·18	17·24	17·76	17·63	23
189	144	112	168	196	283	397	1,342	1,058	2,400	6·93	6·85	6·90	9·46	24
266	236	225	452	898	1,012	852	3,103	2,707	5,810	15·51	16·98	16·16	14·89	25
335	343	231	593	1,181	1,486	1,007	4,008	3,210	7,218	24·72	24·06	24·43	16·74	26
466	338	347	681	1,239	1,818	996	4,474	3,828	8,302	21·03	21·02	21·02	13·77	27
290	251	151	262	459	783	577	2,223	1,757	3,980	12·98	12·67	12·84	9·81	28
177	195	180	465	806	865	679	2,386	2,150	4,536	15·49	16·11	15·77	9·23	29
705	418	369	417	1,609	2,226	1,397	4,862	4,043	8,905	18·17	17·36	17·79	6·58	30
770	767	565	453	456	483	581	4,053	2,713	6,766	21·17	15·43	18·42	9·80	31
50	38	52	112	187	234	377	741	545	1,286	9·34	8·24	8·84	5·26	32
26,367	19,576	20,599	42,943	89,687	90,669	53,175	236,973	203,519	440,492	24·92	25·51	25·19	14·42	

ANNUAL FORM

DEATHS REGISTERED from BOWEL COMPLAINTS

1	2	3		4						
Number.	DISTRICTS.	*Circles of registration.*		*Villages.*		January.	February.	March.	April.	May.
		Number in each district.	No. from which deaths from bowel complaints were reported.	Number in each district.	No. from which deaths from bowel complaints were reported.					
	DELHI DIVISION.									
1	Delhi	15	15	743	336	134	80	76	145	187
2	Gurgaon	16	16	1,239	564	184	173	167	244	239
3	Karnál	14	14	868	364	64	46	59	111	191
	HISSAR DIVISION.									
4	Hissar	12	10	715	115	20	8	29	61	109
5	Rohtak	11	11	498	81	45	27	51	99	106
6	Sirsa	13	13	626	149	19	11	12	49	50
	UMBALLA DIVISION.									
7	Umballa	20	20	2,225	795	80	73	81	176	262
8	Ludhiána	9	9	851	341	38	26	28	55	153
9	Simla	4	4	238	65	10	4	1	7	13
	JULLUNDUR DIVISION.									
10	Jullundur	9	9	1,233	312	22	19	18	42	106
11	Hoshiárpur	14	14	2,178	895	78	66	82	140	552
12	Kángra	15	15	704	391	91	60	75	95	209
	AMRITSAR DIVISION.									
13	Amritsar	10	9	1,078	218	79	51	39	87	222
14	Gurdáspur	17	17	2,302	399	52	39	32	98	255
15	Siálkot	13	13	2,315	461	43	50	52	115	255
	LAHORE DIVISION.									
16	Lahore	20	20	1,672	310	41	20	28	44	90
17	Gujránwála	9	9	1,177	271	21	14	29	38	125
18	Ferozepore	15	13	1,276	189	21	15	16	33	51
	RAWALPINDI DIVISION.									
19	Rawalpindi	18	17	1,725	424	30	28	40	48	199
20	Jhelum	12	11	1,042	163	38	20	29	55	136
21	Gujrat	8	7	1,416	158	25	18	37	79	171
22	Shahpur	15	15	632	212	50	44	42	57	82
	MOOLTAN DIVISION.									
23	Mooltan	13	9	1,233	50	28	23	22	27	30
24	Jhang	9	8	976	140	14	12	6	16	19
25	Montgomery	16	16	1,518	121	15	9	7	15	23
26	Muzaffargarh	12	9	534	37	5	2	3	3	11
	DERAJAT DIVISION.									
27	Dera Ismail Khan	19	17	772	66	15	12	13	25	35
28	Dera Gházi Khan	17	11	422	23	5	8	4	7	13
29	Bannu	12	12	553	113	27	12	25	46	49
	PESHAWAR DIVISION.									
30	Pesháwar	19	18	730	106	47	28	23	38	50
31	Hazára	16	15	1,013	158	17	12	47	251	165
32	Khoát	5	4	454	23	5	3	1	5	2
	Total of the Province ...	427	400	34,958	8,050	1,363	1,013	1,174	2,311	4,160

in the DISTRICTS of the PUNJAB, during each month of the year 1878.

5							6			7			8	9
							Total.			*Ratio of deaths per 1,000 of population.*				
June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Total.	Males.	Females.	Total.	Mean ratio per 1000 for previous five years.	Number.
187	113	159	198	263	307	230	1,212	867	2,079	3·71	3·07	3·41	2·04	1
200	160	378	608	698	514	263	2,252	1,576	3,828	6·08	4·83	5·49	2·48	2
98	72	104	135	181	254	194	955	554	1,509	2·89	1·97	2·47	1·31	3
77	62	40	115	110	73	32	469	267	736	1·76	1·22	1·52	0·69	4
78	38	65	108	281	162	158	718	500	1,218	2·45	2·04	2·27	0·45	5
60	35	25	37	38	17	14	251	116	367	2·14	1·24	1·79	0·94	6
210	111	164	238	436	526	415	1,836	936	2,772	3·33	2·04	2·75	1·43	7
74	65	127	232	289	262	176	879	646	1,525	2·75	2·45	2·61	1·30	8
11	14	16	20	11	5	11	68	55	123	3·07	4·78	3·66	2·01	9
58	47	66	125	151	117	83	514	340	854	1·20	0·96	1·19	1·13	10
283	163	252	363	478	312	170	1,622	1,317	2,939	3·21	3·03	3·13	2·95	11
238	133	78	86	134	126	82	794	613	1,407	2·02	1·75	1·89	2·61	12
154	90	110	145	300	304	274	1,258	597	1,855	2·70	1·62	2·23	1·27	13
156	91	82	110	159	159	103	773	563	1,336	1·54	1·36	1·47	1·84	14
124	63	57	65	90	97	58	681	388	1,069	1·26	0·85	1·07	1·08	15
64	53	70	84	92	150	137	615	258	873	1·43	0·74	1·12	0·89	16
72	43	45	38	49	32	34	382	158	540	1·25	0·65	0·98	0·76	17
35	24	45	83	76	55	46	330	170	500	1·12	0·71	0·94	0·91	18
168	62	64	61	66	78	70	659	255	914	1·75	0·79	1·31	0·65	19
95	33	55	78	92	84	60	447	328	775	1·69	1·39	1·55	1·24	20
178	66	53	36	37	48	29	496	281	777	1·49	0·99	1·26	0·52	21
54	37	46	46	50	51	51	374	236	610	1·91	1·36	1·65	1·40	22
26	20	34	62	72	88	46	295	183	478	1·17	0·88	1·04	0·98	23
23	17	12	22	16	18	24	119	80	199	0·61	0·52	0·57	0·53	24
18	11	13	8	14	13	15	101	60	161	0·50	0·38	0·45	0·49	25
3	7	2	6	8	20	8	50	28	78	0·31	0·21	0·26	0·21	26
26	10	20	29	33	95	53	201	165	366	0·94	0·90	0·93	0·43	27
14	10	11	22	49	55	46	138	106	244	0·80	0·76	0·79	0·44	28
25	22	19	16	34	32	53	220	140	360	1·43	1·05	1·25	0·93	29
57	43	35	55	65	148	189	549	229	778	2·05	0·98	1·55	0·45	30
90	58	32	20	16	27	14	495	254	749	2·58	1·44	2·04	0·68	31
2	1	3	5	6	7	12	40	12	52	0·50	0·18	0·36	0·37	32
2,958	1,774	2,282	3,256	4,394	4,236	3,150	19,793	12,278	32,071	2·08	1·54	1·83	1·24	...

APPENDIX A.

INSPECTION REPORT OF LAWRENCE MILITARY ASYLUM, SANAWUR.

No. 3385 *dated* 26*th November* 1878.

FROM—SURGEON-MAJOR H. W. BELLEW, C. S. I., *Sanitary Commissioner, Punjab.*

To—*The Secretary to Government, Punjab.*

1. I have the honor to submit herewith, for the information of His Honor the Lieutenant Governor, my inspection report on the Lawrence Military Asylum at Sanáwar, inspected on the 19th instant. In reference to the endorsement by the Government of the Punjab No. 3559 dated the 23rd October 1878, on the Memorandum of the Army Sanitary Commission on the Report of the Sanitary Commissioner for the Punjab for 1876, a further report will be submitted shortly, so soon as some special inquiries into the subject are completed.

2. The Sanáwar Military Asylum stands at an elevation of 5,900 feet above the sea, and occupies the top and south slopes of a detached hill, which is situated a couple of miles to the eastward of Kasauli, and lies between the old and new roads from the plains to Simla. The barracks and school rooms, with the residential quarters of the Principal, Medical Officer, School Masters, and other Officials, and the Church, form altogether a compact settlement spread over the upper part of the southern slope and ridge of the hill, where the ground is shaded by pine and other forest trees. The buildings are all substantially constructed in the European style of Indian Military architecture, are single roofed, and generally well placed as to ventilation.

3. I visited all the several Departments of the institution in company with the Revd. Mr. Cole, Principal, and Dr. F. Smyth, Medical Officer, and found neatness, order, and cleanliness reigning every where, conveying the impression that the institution is admirably conducted, and the comfort and well-being of its inmates carefully attended to.

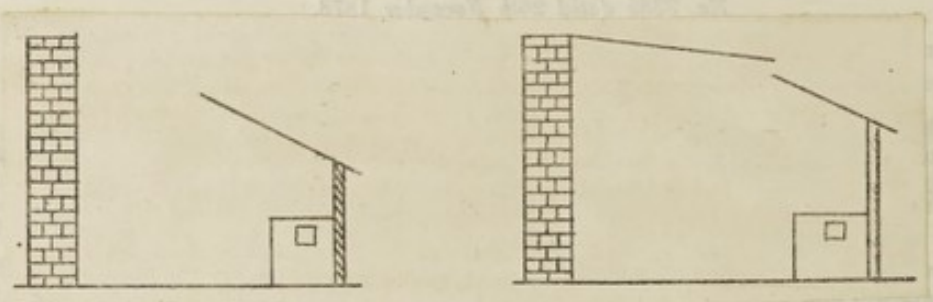
4. The number of wards on the day of my visit was 407, *viz.*, boys 232 and girls 175. There were, besides, 68 European officials and their families, and 163 native *employés* resid ing upon the estate in immediate proximity to the Asylum. The appearance of the children, whom I saw paraded, was very pleasing and satisfactory. Both boys and girls presented a rosy healthy look, which, with their happy and contented faces, spoke of the comfort they enjoy and the care taken of their welfare here;—the boys, rough and full of spirit as they should be, the girls, neat and decorous as befits the sex—both alike do credit to the management they are under.

5. The dormitories, play, mess, and school, rooms for both boys and girls were in remarkably clean and tidy condition, and very freely provided with light and air. In the large dormitory on the boys' side it appeared to me that there were almost too many windows on opposite sides of the large room, giving it a cold look. The roof is lofty and has no cloth ceiling as in the dormitories on the girls' side. In fact there is nothing to cover the inner side of the shingles, through crevices between the layers of which, day light is seen in many places, and doubtless draughts penetrate more freely than is convenient. It would add considerably to the comfort and appearance of this room if the roof were provided with a cloth ceiling for periodical lime washing, as in other dormitories. The bedding is very good, and in ample quantity for the requirements of the winter, and the beds are so arranged that each has a clear superficial area of about 54 feet. The cubic breathing space for each dormitory will be seen in the accompanying Statement No. I. Night closets are provided for in small recesses on the outside of the dormitories and opening into them by a doorway. They are very well kept and conveniently situated. The planking on the floors of most of the dormitories is very old, and at this season the planks being much shrunk and warped, the spaces between them gape a good deal and retain floor-dust and fomites. The dormitories are on the upper floor above the play rooms, and the communication between them is by good roomy flights of steps. In connection with the dormitories, and much too close to them and the passages leading to them, are the lavatories. These places, one for boys and one for girls, are badly situated in narrow spaces between the sleeping barracks and the bank of the hill, and are restricted in area and very much crowded with tubs, towel racks, and rows of basins. The fire places and boilers for hot water are in a detached space at one end. The drainage from these lavatories runs in open surface gutters which lie along the length or cross the width, as the case may be, of the sleeping barracks. These gutters, as I saw them were perfectly clean and free from smell, and they discharge freely over the sides of the hill in different directions. I understand that a project is now under consideration for building new lavatories on an improved plan and in a more suitable situation. Some such change is urgently needed, and will, I hope, be effected without loss of time. I have not seen the plan of the proposed building, but think that provision should be made in them for a number of iron baths fed by pipes with stop-cocks from the boilers, and with vent-plugs at the bottom for emptying and cleaning into the gutters, which should run under the lines of their rows. This would be a far better arrangement, and more economical, than the present system of tubs made of half casks, and would save much labour and loss of time in the service of the bath rooms.

6. With the exception of the night closets attached to the dormitories, all other latrines are in suitable sites outside. There are altogether five of them, *viz.*, one for boys, one for girls, one for infants, and one for each of the Hospitals. I found them all in excellent order and well kept on the dry earth system. They are well ventilated and furnished with iron pans which slide upon side rails under the seats for removal through an opening in the rear. All the latrines are well roofed and have free ventilation under the coping, with the exception only of the main latrine at the side of the boys' play ground. In this latrine the roof covers only that half of the area which is occupied by the row of closets, each of which is open to the front. In consequence of this arrangement there is no efficient cover, and in rainy weather the whole floor of the latrine is more or less constantly wet. The object of the half roof, I understand, was to secure ample ventilation; this, however, might be done without destroying the utility of the latrine, but on the contrary greatly increasing its convenience and preserving its floors and the wood work of its seats from wet and damp by roofing over the other half in

such a manner as to allow the new roof to over-ride the old one at a height of a foot or so, in order to drain on to it, and thus keep the floor below, dry and protected from the weather. The annexed cross section plan will explain what I mean.

PRESENT LATRINE. PROPOSED CHANGE.



7. The excreta of the night closets and latrines are removed daily in covered iron baskets, and buried in trenches at a well chosen site a considerable distance down the hill slope and well out of the way of water-courses and human dwellings. The *poudrette* is not in any way utilized, though it might be so with advantage and profit in the Asylum vegetable garden, which might be made much more productive than it is. With this material in hand, and the land available on the Asylum estate, there should be no lack of vegetables all the year round.

8. The cook houses are in proximity to the mess-rooms and the hospitals. There are altogether five of them, *viz.*, one for each hospital, and one each for the boys' and girls' and infants' departments. They are all built on the same plan, and though kept as clean as was possible, were far from being in a satisfactory state, owing to radical and serious defects of construction and furniture. They are not provided with proper cooking ranges, but have merely the common native hearth set on the ground with no provisions to prevent the spread of ashes over the floor. There is no slop cistern or other place set apart for scullery purposes. The cooking pots, dishes, &c., are washed and scoured and emptied on the floor over nearly one-half of the cook room, which is always in consequence slushy and foul. The floors are paved with loose-set flags and the water lies on the surface till broomed away through a hole in the wall to a sink on the outside. There is no proper provision for keeping these sinks in a wholesome state. They are egg-cup shaped masonry pits sunk in the ground and are emptied by baling from the top, the contents being carried away in buckets daily.

9. The arrangements for the storage of water used in the cook rooms are very objectionable and should be at once remedied. The water is kept in two or three 56 gallon casks, which are placed on end on the floor and are open above; the water being drawn from them by dipping. As I saw these casks, they, in each instance, stood in the slush and scullery water on the kitchen floor. I saw the cook take a tin vessel from the floor, plunge its muddy bottom and his own hand into the water through the top of the cask, pour out the water thus drawn, and set the tin pot on the ground again. This process is repeated daily as the customary thing during the preparation of the different meals. It is not only a dirty custom but a dangerous one, and should be at once put a stop to.

10. The cook houses require a thorough overhaul and renovation. Those, belonging to the boys' and girls' departments are very old and smoke begrimed, and, in the case of the former, over-run by myriads of cockroaches. I found several crawling about the grains of cooked rice and chopped meat all ready to be served at table, whilst the roof timbers were covered with countless swarms of them.

11. The cook houses should be furnished with proper cooking ranges under an arched roof chimney, and the floor hearths should be entirely done away with.

12. In connection with the cooking range there should be a kitchen dresser with shelves and drawers for knives, pans, dishes, &c. There should also be provided a proper slop cistern or scullery tank draining by a vent through the wall into a sink on the outside. At the side of the scullery tank there should be a counter, or ledge for setting utensils on, instead of their being, as is now the case, scoured and emptied and then deposited on the floor of the kitchen. The sink on the outside should be, not sunk in ground as is now the case but, built upon its surface and provided with a vent at bottom so as to allow of its being emptied and flushed with clean water from time to time. Each sink should be connected by a branch gutter with the nearest open drain, and its contents thus run off every evening. By such an arrangement they can be kept clean and wholesome at a tithe of the expense, and trouble, and waste of time now incurred.

13. The water casks or butts now in use in the cook houses should be peremptorily abolished, and some other means adopted by which the water shall be preserved from the contamination and pollution it now suffers. I think that covered iron tanks with a trap door at top for filling and a stop-cock supply-pipe at bottom would be found most economical and efficacious, without the necessity of filtering; for the water as drawn from the spring head reservoir is believed to be pure and of excellent quality.

14. The victualling arrangements of the Asylum are partly in the hands of the Commissariat Department and partly of the Principal. Beef, mutton, and bread are provided by the former, and all other supplies by the latter through contractors. The rations are served according to a sanctioned scale, copy of which is annexed (Statement No. 2) and the allowance is found to be amply sufficient for the maintenance of growing children in good health. The rations I saw on the day of my visit were very good, and are, I believe, generally approved of. The bread is the same as that served to the troops at Kasauli. The milk is supplied by a contractor who collects the required quantity from the villages around. The daily consumption is about 60 gallons on the average of the year; and, as the amount is made up by contributions from a number of different villages, there must

always be a risk of contamination and disease being, through this medium, introduced into the Asylum. Dr Smyth informs me that a plan has been submitted to Government by the Principal for the establishment of a home dairy on the Asylum estate. There is no doubt of the advantages of the measure in a sanitary point of view, and its economical aspect too is I believe encouraging to the hope of the early sanction of the proposal.

15. The water supply is from a spring on the estate, and this during half the year is supplemented by a second spring at Garkhal, a short distance beyond its limits. The former spring where it issues on the surface is received into a long narrow covered reservoir with an open ventilator at each end. From the reservoir the water flows into a covered well, fitted with a pump for drawing the supply, and the well is provided with an outlet for the overflow to escape down the hill. This spring is situated about 1,000 feet below the Asylum, and is well protected against the ordinary sources of surface contamination on the surroundings of the site. The open ventilators of the covered reservoir, however, might with advantage be closed by folding doors. The water of both the springs is good and soft, and is believed to be of the same quality now as when last analysed in 1870. The results of these analyses are given in the annexed Statement No. 3. The water is supplied to the Asylum, by a service of 30 mules, in *pakhals* or leather skins. The stables of the mules are situated on a flat ledge above the spring, which is an objectionable spot, as being in the line of drainage to the spring and its feeding ground.

16. The Hospitals for boys and girls are distinct buildings and well suited to their special purposes. I found them models of neatness, cleanliness and comfort, and a credit to the management of Dr. Smyth, whose devotion to his charge is shown in the careful record of each case, and a painstaking inquiry and treatment of the slightest ailments. On the day of my visit there were 8 patients in the boys' and 13 in the girls' hospital, including 3 infants being reared ; and none of them were seriously ill. Up to date there have been two deaths since 1st January last, *viz.*, one on 28th July from abscess of liver, and one on 5th October from abscess of the brain. Previous to the first of these casualties, no death was recorded in the Asylum for a period of 18 months.

17. The clothing of the children is of *pattu* lined with cotton check, and does not seem to be sufficiently warm for the winter climate of this place. The *pattu* is of light and loose texture and can be seen through, even when lined, if held up against the light. It might be much improved, in point of warmth if well shrunken and *mulled* previous to being made up. The shoes are country made, and since the use of rosin varnish recommended by Dr. DeRenzy in 1876 are found to be more durable and impervious to wet. The boys' helmets are of leather, and appeared to me of faulty shape as affording no protection to the temples, though I am not aware that any ill effects have been attributed to their defective shape.

No. 3505, *dated* 11*th December* 1878.

FROM—H. W. BELLEW, ESQUIRE, C. S. I. *Sanitary Commissioner, Punjab.*

To—*The Secretary to Government, Punjab.*

With reference to para. 1 of my Inspection Report of the Lawrence Military Asylum at Sanáwar, I have the honor now to submit, for the information of His Honor the Lieutenant Governor, the Supplementary Report on the inquiry into the subject of the prevalence of enteric fever in that Institution, in reference to the suggestion of the Army Sanitary Commission in their memo. on the Sanitary Report for the Punjab for 1876.

The report consists of a copy of certain questions made by me to the Officer in Medical charge of the Asylum, and his detailed replies thereto. It will be seen from answer 20 that, during the last 20 years, one-half of the period was entirely exempt from the disease, and that with the exception of the outbreaks of 1849 and 1875, the medical history of the Asylum does not, as far as it goes, appear to warrant any assumption of prevalence.

The questions and the replies thereto are herewith placed opposite to one another.

Question 1.—Statistical statement of the prevalence of, and mortality from, enteric fever in the Lawrence Military Asylum, Sanáwar for the years 1859 to 1878 inclusive according to annexed tabular form.

Answer 1.—A tabulated statement of cases of enteric fever since 1859 is subjoined, but no *authentic* data as to the prevalence of the disease prior to 1864 exist.

In this year the executive medical charge of the Asylum was vested in the Indian Medical Department and a resident Medical Officer appointed. I have carefully looked over the meagre details recorded before that year, and find, generally speaking, the death rate very high ; as many as 10 or 12 deaths occurred in some years, but the system of classification was so imperfect, that I am unable to arrive at any exact conclusions bearing on enteric fevers.

Admissions to hospital are merely entered as "fevers," no fixed system of nomenclature was adopted, no Medical or Sanitary Report was furnished, and no Case Book was kept, but from the "Burial Register" of the Institution I gained the following information. :—

1860.—October, one fatal case of "remittent," one fatal case "typhoid" (both probably "typhoid").

1861.—In May, 2 fatal cases "typhoid."

In June, one fatal "typhus," in August one fatal "typhoid," in October one fatal "remittent."

1863.—In May, one fatal "fever" (sic) in September one fatal "typhoid."

1864.—One fatal case "measles" and "typhoid" (sic).

In former years the deaths from diarrhœa appear to have been excessive, and I find one entry from "diarrhœa with fever." Dr. Duka, who subsequently held medical charge of the Asylum, writes in 1869 :—

"That seeds of typhoid fever exist at Sanáwar there can be no doubt ; even the scanty records proved that it prevailed as early as 1860."

A tabulated statement of the prevalence and mortality from enteric fever in the Lawrence Military Asylum Sanáwar for the years 1859 to 1878 inclusive is given below :—

Tabulated statement of prevalence and mortality from enteric fever at Sanáwar—greatest elevation above sea 5,900 feet.

Year.	Average strength.			Number of cases of enteric fever.			Deaths from enteric fever.			Total rain fall in inches.	Months in which the disease prevailed.
	Boys.	Girls.	Total.	Boys	Girls.	Total.	Boys.	Girls.	Total.		
1859 ...	198	143	341	No record.							
1860 ...	222	169	391		Ditto		1	...	1		In October; also 1 fatal case of "remittent."
1861 ...	259	210	469		Ditto		3	...	3		2 in May, 1 August, 1 "typhus" in June, 1 remittent. In October; all fatal.
1862 ...	252	199	451		Ditto		...	...	...		
1863 ...	255	207	462		Ditto		2	...	2	No record.	One fatal case "fever" in May, one fatal case typhoid in September.
1864 ...	219	184	403		Ditto		...	1	1		"Measles and typhoid."
1865 ...	223	195	418	...	3	3	...	...	...	59.6	
1866 ...	228	210	438		None			None		43·9	
1867 ...	251	197	448	2	1	3	1	...	1	65·1	August, September and November.
1868 ...	258	205	463	1	...	1	1	...	1	63·3	June.
1869 ...	255	182	437	8	5	13	2	1	3	48·1	April, June, July and September (most cases in July).
1870 ...	245	173	418		None			None		51·4	
1871 ...	234	186	420		Ditto			Ditto		89·0	
1872 ...	238	198	436		Dit o			Ditto		73·1	
1873 ...	230	191	421		Ditto			Ditto		54·3	
1874 ...	250	185	435		Ditto			Ditto		40·0	
1875 ...	243	189	432	3	3	6	1	3	4	57·6	May, July, August, September and October.
1876 ...	239	188	427	...	1	1		None		66·5	August
1877 ...	234	176	410	...	...	...		Ditto		67·5	
1878 ...	242	178	420	1	...	1		Ditto		48·2	August

Question 2.—Note whether enteric fever prevailed also at the adjoining stations at the time, or times, that it made its appearance in the Asylum; and if so state whether there were any grounds for supposing that the disease may have been carried from the Asylum to them or from them to the Asylum?

Answer 2.—I am unable to give much information bearing on Question 2. I am told, however, that as many as 40 fatal cases occurred in Sabathu in 1869.

During the outbreak of typhoid at Sanáwar in 1875 when I can speak from my own experience, cholera prevailed in Dagshai, Sabathu and Kasauli, and to a great extent in the district; Sanáwar entirely escaped a visitation of the disease; but typhoid fever appeared, and in the absence of any traceable cause for the outbreak I am inclined to think it possible that the atmospheric influences, capable of producing cholera, may have conveyed its "virus" in a modified or allotropic form, as typhoid, to Sanáwar. The type in that year was certainly most malignant, and unlike any thing I have seen since. The patient was struck down suddenly and in some instances never appeared to rally, and a hard black quivering tongue with low delirium were very early symptoms; I may add that the theory of the identity of the poisons has been advanced by several pathologists.

Since 1875, enteric fever has appeared *yearly* in these stations mentioned, notably and persistently at Sabathu. I have no grounds for supposing that enteric fever has ever been carried from adjoining stations.

Question 3.—Is there any constant communication between the Asylum and the adjoining stations? If so, briefly describe the nature of it, noting especially whether visitors to the Asylum from the adjoining stations pass the night, or stay a few days there, and vice versâ.

Answer 3.—Constant and daily communication exists between the institution and Kasauli, on which station we depend for all our supplies; and which the boys, and the officials, frequently visit; our communication with Dagshai and Sabathu is very slight; visitors from adjoining stations (Europeans) seldom pass the night at Sanáwar and vice versâ. I dare say natives frequently do so.

Our Asylum wards, proceeding to, or returning from, these stations, on leave, would be examined on departure and return by the Medical Officer, who, if cognizant of infectious disease at such stations, would not sanction the leave.

Question 4.—Have any alterations been made in the dormitories and the lavatories especially in respect to ventilation and drainage, and if so, when were they made.

Answer 4.—Great improvements and alterations have been made in dormitories and lavatories from time to time. This remark applies to the entire station, which has shown progressive development for 30 years, and is still constantly being added to and improved. In the dormitories, however, during the last 15 years, ridge ventilation for the upper story has been introduced and perflation of air greatly increased by opposite ventilators in the lower: the number of beds considerably reduced, and the maximum number of inmates fixed by Government at 432 instead of 460; iron cots substituted for wooden ones; curtains at night in winter introduced; new staircases opened; new flooring laid down in the lower dormitories of the boys' Department; *chuts* or ceiling cloths in lower rooms nailed up tight to the roof; the hospital (or "Infirmary" as it was called) which once formed part of the dormitories, removed to new and spacious buildings, and 2 or 3 small rooms consequently thrown into one: lavatories have been repaired, and their drainage improved, and wooden gratings for standing on after bathing have been introduced; English bar soap substituted for country soap.

Question 5.—Have the lavatories always been in close connection with the dormitories as at present? And have they always been managed on their present system? Please give dates of any alterations.

Answer 5.—The lavatories have always been, and are still, in close connection with the dormitories, and have always been managed on their present system, but several wards are not now allowed to bathe in one tub as formerly prevailed.

Question 6.—Have the night closets always been on their present plan and situation in respect to the dormitories? If not, when were alterations made?

Answer 6.—Night closets have always been on their present plan in the Boys' Department, but increased ventilation, and free use of McDougall's powder, has been lately secured; commodes are, and have always been, used in the infant department.

Question 7.—Have the cook houses been always worked on the present plan, or have any changes been made, and when?

Answer 7.—The boys' cook-house was formerly attached to their barrack; it has been within the last 10 years rebuilt and detached.

The girls' and the hospital cook-houses, are of recent date. The general plan has always been the same, *viz.*, a large hearth with native *chullahs*, but a model kitchen with English stoves and appliances, where all girls over 16 are taught cooking under European supervision, was introduced about 8 years ago; all *degchies* and vessels used in the kitchens are tinned or *kullâied* every 14 days. The Medical Officer frequently inspects the dinners, utensils, &c.

I consider the kitchens badly furnished and capable of great improvement. The receptacles for dirty water are a recent introduction, but are faulty in construction.

Question 8—Have any changes been made in the victualling arrangements of the Asylum? If so, state their nature and when they were made?

Answer 8.—Bread, meat, tea, and sugar have been supplied by the Commissariat Department during the last 20 months. They were formerly supplied by contractors. The dietary scale has been altered from time to time.

Question 9.—Describe the former and the present arrangements for the supply of bread? Is it generally of good quality?

Answer 9.—Bread was formerly supplied by a contractor and baked on the premises; it is now made and baked at Kasauli, and carried over daily by coolies. It is generally of good quality.

Question 10.—Describe the former, and the present arrangements for the supply of water, and specify the various sources whence it is derived? How is the water stored for daily use? Are the chances of its contamination, in the ordinary course of daily use, provided against? If so, in what manner? How is the water conveyed from the spring to the Asylum?

Answer 10.—Former and present sources of water are identical, *viz.*, from our own, and from the Garkhal spring; both springs are perennial; the Garkhal spring is only used when water becomes scarce; it is 2 miles distant, and in independent territory. Analyses of both have been submitted. Our own tank has been greatly improved within the last 4 years, and is now arched over with solid masonry, and safe from surface contamination; a pump has been erected, and the premises in the vicinity cleansed. Water is stored for daily use in the cook houses, in 56 gallon casks (and coppers for boiling), in bath rooms in ½ cask tubs; and at Barracks in 3 *chattie* filters. The chances of contamination are not sufficiently provided against, especially in the cook houses. The filters are frequently interfered with, by the children; it is most difficult to keep them in working order: every child cannot be constantly watched, and I have known a boy with good filtered water beside him, go into a lavatory, and drink out of a tub: each hospital is provided with a McNamara filter. They will, I think, soon be generally introduced: six more will be sufficient. All water is conveyed by mules with *pakhâls*, from which *massacks* are filled. A *massack* on being cut open by the medical officer, was found clean and free from odour.

Question 11.—Is the water habitually filtered? If so, by what process and for what Departments of the institution? Since when have filters been used.

Answer 11.—All drinking water is filtered in the ordinary 3 *chatties*, with sand and charcoal. The water for cooking is not filtered; filters were introduced in 1865. There has been a considerable decrease in diarrhœa and dysentery since 1865.

Question 12.—Describe the present, and the former arrangements for the supply of milk, and mention the date of any changes that may have been made?

Answer 12.—Milk is, and has always been, supplied by a contractor; he keeps about 50 cows of his own, but indents largely on villages in the neighbourhood; it is conveyed in brass vessels to the ration-stand and there issued.

Question 13.—Is the milk ever tested as to specific gravity, or its actual quality? What is the quantity daily consumed in the Asylum on the average of a year? Are the cows ever inspected, or under any supervision by the authorities of the Asylum? Have any complaints been made as to the quality of the milk?

Answer 13.—I have frequently tested the milk, and have at times found fault with, and reported it; as a rule it is pure and wholesome. The specific gravity is not reliable as it can be raised by admixture of buffaloes' milk, which, I think is the adulteration most often practised. Such adulteration could only be detected microscopically; the annual quantity consumed on the average is about 57,560 *sérs*. The cows kept by the contractor himself are frequently inspected. I have visited cow houses, and found them fairly satisfactory, but ventilation deficient.

Question 14.—Do the children eat native sweetmeats? If so, is the confectioner under supervision as to the shop he keeps and the articles he sells?

Answer 14.—The children eat quantities of native sweetmeats which are sold twice a week by men provided with passes, after inspection by the Medical Officer. The chief confectioner lives in the Bazár, and his shop is clean. These men also sell fruit; but when the boys go out for a ramble to Kasauli &c., they doubtless purchase and eat large quantities of rubbish.

Question 15.—What is the state of the sewerage and drainage of the Asylum estate as a whole, and of the separate blocks of its buildings individually whether they be occupied by wards or by officials?

Answer 15.—Sewers and drains are very satisfactory, separately and individually; when practicable they are open; they are of pucca masonry; only two pass under habitations, *viz.*, one under the boys', another under the girls' barracks; the latter is objectionable, though it is so wide, that a sweeper can walk through it; all drains near buildings are flushed, and deodorized with lime, and McDougall's powder.

Question 16.—Are there any obstructions to the natural free drainage of the surface, especially in the vicinity of buildings? Have foundation walls any where obstructed subsoil percolation? Is the watershed every where free and quick in the monsoon season? Do temporary springs issue at any parts of the surface of the estate during the monsoon season? if so, are they in the vicinity of the houses?

Answer 16.—I don't know of any obstruction to the natural surface drainage; all roof catch-water is collected in tanks erected in 1874 for prevention of fire. I don't know of any foundation walls obstructing subsoil percolation. The water shed is particularly free and quick in the monsoon season, rushing down the *khuds* with great velocity. Two temporary springs issue on the estate in the monsoon season; one is used by natives only, the other not at all; neither, are very near buildings.

Question 17.—What is the geological structure of the surrounding hill and what is the nature of the surface soil? Is the Asylum spring in any way affected during the monsoon season? Are the springs fed in this season by filtration through a porous soil or by percolation through fissures and clefts in an impervious upper crust?

Answer 17.—The geological formation of Sanáwar and vicinity is red and grey sandstone, with some layers of clay slate, and debris intervening. There are vestiges of nummulitic strata, for which the Sabathu range is remarkable. The Asylum and adjacent springs are fed by filtration, through a porous soil.

Question 18.—Are the sewers all open surface gutters, or are any of them under ground drains? Are there any of these latter in the immediate vicinity of the Asylum buildings? What is their usual condition? Does water flushing serve to keep them wholesome and clean? Is a foul smell ever observed to proceed from them?

Answer 18.—Only two pass under habitations as above stated, *viz.*, one under the boys' another under the girls' barracks. The latter is objectionable, though it is so wide that a sweeper can walk through it; all drains near buildings are flushed, and deodorized with lime, and McDougall's powder; water flushing keeps them clean; I have noticed foul smells near private houses.

Question 19.—What is the condition of the latrines in the monsoon season? Is the dry earth system carefully carried out, and what are the special provisions made to ensure its efficiency? Have any alterations been made in the plan and system of working the latrine? If so state them and when they were made.

Answer 19.—The latrines, like those in all hill stations, are more unsatisfactory of course in the monsoon season (especially in the boys' Department) when the dry earth system is difficult to carry out efficiently. This system, is, as a rule, carefully and successfully carried out. There is a good staff of mehtars (sweepers); and well built houses are constructed for the storage of the dry earth, a large stock of which, is laid in before the rains. No alterations have recently been made in the plan of working the latrines. I consider them in excellent order.

Question 20.—Please state your opinion as to the causes of the former prevalence of enteric fever in this Asylum, and the causes of its rarity during the past few years.

Answer 20.—After a careful research into the history of the Asylum, extending over a period of 30 years, I am led to the opinion, that typhoid fever was never very "prevalent" at Sanáwar; certainly, not more so, than in adjoining stations; in one of which it appears to be endemic. In the 20 years under review, we find about half the period entirely exempt from it; and if we exclude the great outbreaks of 1869 and 1875, the medical history of the Asylum does not, as far as it goes, appear to warrant any assumption of prevalence.

The Institution has doubtless enjoyed a marked immunity from the disease during the last 3 years, and this I consider due to—

(1).—Move of all inmates to Kalka in January 1876 with total evacuation and thorough cleansing of all dormitories, school rooms, and premises.

(2) (*a*).—Early intimation to Medical Officer of *all* cases of illness amongst natives on the estate, and especially of cases of *fever* occurring near the cow-houses and milk man's premises.

(*b*).—Early attention to, and surveillance over, all cases of febrile disturbances among the children.

N. B.—The disease on the development of the very earliest symptoms, cannot of course be checked; but a child with pythogenic germs in its system may, even in the incubative malaise, propagate such germs in excreta, to 3 or 4 compartments of a latrine, to be used immediately after and possibly in an uncleaned state by other children.

3. Complete isolation of suspicious cases.
4. Absence of over-crowding.
5. Improved ventilation.
6. Very efficient conservancy.
7. Complete protection of water spring.

Question 21.—Please record any other information on this subject which your experience and knowledge of the place may enable you to give?

Answer 21.—I have no further remarks to offer on the subject of enteric fever at Sanáwar, except, to draw attention to the fact, that recent cases of that disease present, a totally different type to those I had an opportunity of studying in 1875. I would also point out that the number of inmates was highest in 1861, a most unhealthy year, and again immediately preceding 1869, the year of our greatest outbreak of enteric fever.

On the whole, Sanáwar must, I think, be considered an exceptionally healthy station, for apart from the question of enteric fever it has of late years escaped two other dread diseases, which appeared in the vicinity, *viz.* cholera and diphtheria.

Statement No. 1.—*Dormitories.*

Departments.	Number.	Length.	Breadth.	Height.	Superficial area.	Calculated for beds.	Superficies to each bed.	Cubic feet to each bed.	Remarks.
Boys.	1	109	30	30	3,270	65	50·30	1,509·0	
	2	78	18	23	1,404	28	50·14	1,153·22	
	3	45	32	22	1,440	28	51·42	1,131·24	
	4	45	32	22	1,440	28	51·42	1,131·24	
	5	45	32	22	1,440	28	51·42	1,131·24	
	6	46	31	12	1,426	28	50·92	611·04	
	7	27	31	12	837	15	55·8	669·6	
Girls.	1	76	30	11½	2,280	45	50·66	569·92	
	2	16	24	11½	1,464	29	50·47	580·40	
	3	76	27	23	2,052	41	50·04	1,150·92	
	4	55	24	23	1,320	26	50·76	1,167·48	
	5	26	23	11	598	11	54·36	598·0	
Infants.	1	20	25	12	500	12	41·66	500	
	2	20	25	12	500	12	41·66	500	
	3	20	25	12	500	12	41·66	500	
	4	20	25	12	500	12	41·66	500	
	1	20	25	13	500	4	125·0	1,625	Attic with sloping roofs.
	2	20	25	13	500	4	125·0	1,625	
	3	20	25	13	500	4	125·0	1,625	
	4	20	25	13	500	4	125·0	1,625	
Hospitals. Boys	1	40	20	15	800	12	66·66	999·9	
	2	40	20	15	800	12	66·66	999·9	
Girls	1	40	20	15	800	12	66·66	999·9	
	2	40	20	15	800	12	66·66	999·9	

STATEMENT No. 2 L. M. ASYLUM, SCHOOL.

DIETARY TABLE FOR CHILDREN.

BREAKFAST DAILY.

Bread,	8	oz.
Milk,	8	oz.
Water,	2	oz.
Sugar,	½	oz.

SUPPER DAILY.

The same as breakfast. On Sundays ½ oz. of Butter.

DINNERS.

SUNDAY.—"*Roast Beef and Plum Pudding.*"

Meat (Roast),	8½	oz.
Potatoes.	8	oz.
Onions,	1	oz.
Pudding. Soojee and Flour,	4½	oz.
Pudding. Sugar,	½	oz.
Pudding. Suet,	¾	oz.
Pudding. Ghee,	½	oz.
Pudding. Milk,	1½	oz.
Pudding. Raisins,	1	oz.
Salt for whole,	8	lbs.
Spice, ditto,	6	oz.
Pepper,	10	oz.

MONDAY.—"*Vegetable Soup and Meat.*"

Meat,	8½	oz.
Potatoes,	8	oz.
Bread,	4	oz.
Onions,	1	oz.
Vegetable,	4	oz.
Salt for Whole,	8	lbs.
Pepper for whole,	12	oz.
Flour,	¼	oz.

TUESDAY—"*Pea Soup and Meat.*"

Meat,	8½	oz.
Potatoes,	8	oz.
Bread,	4	oz.
Onions,	1	oz.
Split peas,	2½	oz.
Salt for whole,	8	lbs.
Pepper ditto.	12	oz.

WEDNESDAY.—*Winter Season.*

Salt Beef,	8½	oz.
Bread,	4	oz.
Mustard for whole,	2	Bots.
Vinegar for ditto.	6	Bots.
Rice Pudding,	4	oz.
Sugar,	1	oz.

WEDNESDAY.—*Summer Season.*

Beef Steak,	8½	oz.
Potatoes,	8	oz.
Soojee or rice pudding,	4	oz.
Onions,	1	oz.
Salt,	7	lbs.
Pepper,	10	oz.

THURSDAY.—"*Barley Soup, Meat and Suet Pudding.*"

Meat,	8½	oz.
Potatoes,	8	oz.
Onions,	1	oz.
Soojee and flour,	4½	oz.
Suet,	¾	oz.
Sugar,	½	oz.
Milk,	1½	oz.
Salt for whole,	8	lbs.
Pepper for do.	12	oz.

FRIDAY.—"*Meat Pudding.*"

Meat,	8	oz.
Potatoes,	6	oz.
Soojee and flour,	4½	oz.
Onions,	1	oz.
Salt for whole,	11½	lbs.
Pepper,	12	oz.
Spice,	6	oz.

SATURDAY—"*Vegetable Soup & Meat.*"

Meat,	8½	oz.
Potatoes,	8	oz.
Bread,	4	oz.
Flour,	¼	oz.
Onions,	1	oz.
Vegetables,	4	oz.
Salt for whole,	8	oz.
Pepper,	12	oz.

The Orderlies, Teachers, and Sergeants get additional Breakfast.

Meat,	8	oz.
Butter,	½	oz.
Coffee,	¼	oz.

SUPPER.

Tea,	¼	oz.
Butter,	½	oz.

There are occasional variations made, such as giving Tarts, instead of Puddings; Kitchree, Cutlets, &c., instead of Soup and meat. Salad with cold meat, Watercress for Breakfast &c., when vegetables and fruit are in season.

Statement No. 3, Chemical analysis of the water of springs in the vicinity of Sanáwar.

	Physical Properties.	Reaction.	Total Hardness.	Permanent Hardness.	Removable Hardness.	Oxygen required for oxidation of oxidable matter in 1000 grs.	Nitric acid in grs per gallon	Nitrous acid ditto.	Phosphoric acid.	Free ammonia.	Sulphurretted Hydrogen.	Total solids in grains per gallon.	Volatile matter.	Mineral matter.	Lime.	Magnesia.	Silica.	Chlorine.	Sulphuric acid.	Remarks.
Water from Sanáwar spring.	Good.	Alkaline.	5·3	2·27	3·03	000·92	None	None	None	None	None	8·75	1·05	7·7	3·8	Traces	0·75	0·43	Traces	Water very good,
Water from Gurkhal much used by asylum. *	Good	Alkalam.	7·6	3·6	4·0	000·3	None	None	None	None	None	17·6	1·75	15·85	9·2	Traces	Traces	1·4	1·75	This source of supply will be brought especially under the notice of Govt.

* This spring is now (1878) only used when our own supply is exhausted.

LAWRENCE MILITARY ASYLUM AT SANAWAR.

A.—Table showing the SICKNESS *and* MORTALITY *among the* CHILDREN *of the above* ASYLUM *during the year* 1878.

Months.	Average strength.		Average No. daily sick.		No. daily sick per cent. of strength.		No. of deaths.		Died per 1000 of strength.		Causes of deaths in Hospital			
											Hepatitis		All other causes.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
January	234	171	9·74	10·48	4·16	6·12	...	...	...	...	...	...	...	...
February	234	173	13·85	13·92	5·91	8·04	...	...	...	...	...	...	...	...
March	241	176	10·51	10·00	4·37	5·68	...	...	...	...	...	...	...	...
April	248	174	9·56	9·85	3·85	5·66	...	...	...	...	...	...	..	...
May	252	176	9·22	8·80	3·66	5·00	...	...	...	...	—	...	...	...
June	252	175	13·73	10·26	5·44	5·86	...	...	...	...	...	...	...	...
July	250	176	12·32	11·96	4·92	6·79	1	...	4·00	...	1	...	...	...
August	250	174	10·67	14·74	4·26	8·47	...	...	...	...	...	...	...	...
September	249	174	8·23	12·86	3·30	7·39	...	...	...	...	...	...	...	...
October	238	172	7·12	9·41	2·99	5·47	...	1	...	5·81	...	...	...	1
November	230	173	8·46	13·33	3·67	7·70	...	...	...	..	...	...	...	...
December	231	175	6·87	13·12	2·97	7·50	...	...	...	...	...	...	...	...
For the year	242	174	10·02	11·56	4·12	6·64	1	1	4·12	5·74	1	...	...	1

Distribution of children according to Age on 1st July 1878.

SEX.	2 and under 5 years.	5—10.	10—15.	15—20.	Total of all ages.	REMARKS.
Boys	6	85	116	43	250	
Girls	8	56	81	31	176	
Total ...	14	141	197	74	426	

B.—TABLE showing the CAUSES of ADMISSIONS into HOSPITAL among the

year

NUMBER IN

Causes of admission.	*January.*		*February.*		*March.*		*April.*		*May.*		*June.*	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys	Girls.	Boys.	Girls.	Boys.	Girls.
Small pox	...	..	...	...	...	...	...	...	...	...	...	...
Chicken-pox	...	...	...	..	...	...	6	...	3	4	2	1
Measles	...	...	...	...	...	...	...	...	...	...	...	...
Enteric fever	...	...	...	...	...	...	...	...	...	...	...	...
Simple continued fever	...	...	...	...	...	...	...	...	...	...	...	...
Intermittent, and remittent fever ...	...	...	...	1	...	...	1	...	...	...	..	...
Malignant cholera	...	...	...	...	...	...	...	...	...	...	...	..
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...
Hooping-cough	...	...	...	...	...	...	...	...	...	...	...	...
Mumps	...	...	...	...	...	1	...	1	...	...	...	2
Muscular rheumatism	...	...	...	...	1	...	...	...	2	...	...	...
Phthisis pulmonalis	...	...	..	...	...	...	...	...	...	...	1	...
Meningitis	...	...	...	...	...	...	...	...	...	...	..	...
Sun-stroke	...	...	...	...	1	...	..	...	...	...	...	...
Epilepsy	...	1	...	1	...	...	...	...	...	2	...	...
Conjunctivitis (Opthalmia)	...	1	...	...	...	...	...	...	1	2	...	...
Valve disease of heart	...	...	...	...	...	...	...	...	...	...	...	...
Croup	2	12	...	1	1	...	...	...	...	...	...	...
Bronchitis	...	...	...	...	...	...	...	...	...	..	...	...
Pneumonia	1	...	...	...	1	1	...	...	...	..	...	...
Dysentery	...	...	...	1	...	...	1	1	1	...	1	...
Diarrhœa	1	...	2	...	2	1	1	1	1	1	3	5
Ulcer	...	...	...	...	1	..	1	...	...	...	...	1
Tinea favosa	2	3	2	...	...	2	1	2	...	...	5	2
Itch	...	...	...	...	...	...	...	...	...	...	...	...
Wounds and accidents	3	...	4	...	1	...	1	1	6	1	6	...
All other causes	12	11	19	10	31	8	8	9	5	5	14	4
Total	21	28	27	14	39	13	20	15	19	15	32	15

Admitted per cent of the average

	8·97	16·37	11·53	8·09	16·18	7·38	8·06	8·62	7·53	8·52	12·69	8·57

CHILDREN of the LAWRENCE MILITARY ASYLUM SANAWAR during the 1878.

EACH MONTH.												*Total admissions during the year.*		*Admitted per cent. of strength.*		*Died per cent. of admissions.*	
July.		*August.*		*September.*		*October.*		*November.*		*December.*							
Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	11	5	4·53	2·87	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	1	...	...	...	...	...	...	...	...	...	1	...	0·41	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	1	...	...	1	1	1	...	3	3	1·24	1·72	...	...
..	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	1	...	4	...	1	1	...	...	1	1	11	0·41	6·31	...	...
...	...	2	...	...	...	...	...	...	...	...	...	5	...	2·06	...	...	...
...	...	..	...	...	...	...	...	...	...	..	...	1	...	0·41	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	..	...	...	...	...	...	...	...	...	...	..	1	...	0·41	...	...	...
...	...	...	...	...	...	...	...	...	2	..	1	...	7	...	4·02	...	...
1	2	3	...	2	1	3	6	1	2	...	..	11	14	4·53	8·04	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	...	...	...	...	...	...	...	..	...	...	3	14	1·24	8·04	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	2	1	0·82	0·57	...	...
3	...	2	3	...	2	...	...	...	...	...	...	8	7	3·30	4·02	...	...
8	5	7	2	2	...	...	...	...	...	...	...	27	15	11·13	8·61	...	...
...	...	1	...	...	...	...	1	1	...	1	...	5	2	2·06	1·14	...	...
...	1	...	1	...	1	...	1	...	...	...	...	10	13	4·12	7·46	...	...
...	...	...	...	...	...	...	...	...	...	...	1	...	1	..	0·57	...	..
4	...	2	...	5	...	2	2	4	1	2	...	40	5	16·53	2·87	...	...
13	10	5	5	6	10	12	10	16	16	7	11	148	109	61·15	62·64	0·67	0·91
29	19	23	12	15	19	17	21	24	22	11	14	277	207				

strength in each month.

11·16	10·79	9·20	6·89	6·02	10·91	7·14	12·20	10·43	12·71	4·76	8·00	114	118				

LAWRENCE MEMORIAL ASYLUM AT MURREE.

A.—Table showing the SICKNESS and MORTALITY among the CHILDREN of the above ASYLUM during the year 1878.

Months.	Average strength.		Average Number daily sick.		Number daily sick per cent. of strength		Number of deaths.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
January ...	84	65	3·00	0·00	3·57	0·00	...	...
February ...	85	65	5·21	0·64	6·12	0·98	...	...
March ...	88	67	1·96	2·12	2·22	3·16	...	...
April ...	90	67	0·26	0·96	0·28	1·43	...	...
May ...	88	67	0·03	0·00	0·03	0·00	...	...
June ...	87	65	0·13	0·00	0·14	0·00	...	...
July ...	84	64	0·00	0·54	0·00	0·84	...	...
August ...	85	67	0·09	1·00	0·10	1·49	...	...
September ...	78	62	0·10	1·20	0·12	1·93	...	...
October ...	78	56	0·29	0·00	0·37	0·00	...	...
November ...	80	57	0·53	0·33	0·66	0·57	...	...
December ...	83	58	0·00	0·00	0·00	0·00	...	...
For the year ...	84	63	0·96	0·56	1·13	0·86	...	...

DISTRIBUTION of CHILDREN according to AGE on 1st July 1878.

Sex.	2 and under 5 years.	5—10.	10—15.	15—20.	Total of all ages.	
Boys ...	...	40	39	8	87	
Girls ...	...	26	33	6	65	
Total ...	...	66	72	14	152	

B.—TABLE showing the CAUSES of ADMISSIONS into HOSPITAL among the

year

Causes of Admissions.	Number in											
	January.		*February.*		*March.*		*April.*		*May.*		*June.*	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
Small-pox	...	...	...	...	...	...	...	...	...	...	...	...
Chicken-pox	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...
Enteric fever	...	...	...	...	...	...	...	...	...	...	...	...
Simple continued fever	...	...	...	...	...	...	...	...	...	...	...	...
Intermittent and remittent fever ...	...	...	...	...	...	...	...	...	...	...	...	...
Malignant cholera	...	...	...	...	...	...	...	...	...	...	...	...
Diphteria	...	...	...	...	...	...	...	...	...	...	...	...
Hooping-cough	6	...	1	1	...	...	...	...	...	...	...	...
Mumps	...	...	...	...	...	...	...	...	...	...	...	...
Acute rheumatism	...	...	...	...	...	...	...	...	...	...	...	...
Phthisis pulmonalis	...	...	...	...	...	...	...	...	...	...	...	...
Meningitis	...	...	...	...	...	...	...	...	...	...	...	...
Sun-stroke	...	...	...	...	...	...	...	...	...	...	...	...
Epilepsy	...	...	...	...	...	...	...	...	...	...	...	...
Conjunctivis (Opthalmia)	...	...	...	...	...	...	...	...	...	...	...	...
Valve disease of heart	...	...	...	...	...	...	...	...	...	...	...	...
Croup	...	...	...	...	...	...	...	...	...	...	...	...
Bronchitis	...	...	...	1	...	...	...	...	...	...	...	...
Pneumonia	...	...	...	...	...	...	...	...	...	...	...	...
Dysentery	...	...	...	1	...	...	...	...	...	...	...	...
Diarrhœa	...	...	...	...	...	...	...	...	...	...	...	...
Ulcer	...	...	...	...	...	...	...	...	...	...	...	...
Tinea favosa	...	...	...	...	...	...	...	...	...	...	...	...
Itch	...	...	...	...	...	...	...	...	...	...	...	...
Wounds and accidents	...	...	...	...	...	1	1	...	...	...	...	...
All other causes	...	...	...	...	...	2	1	3	...	...	1	...
Total ...	6	...	1	3	...	3	2	3	...	...	1	...
	Admitted per cent. of the											
	7·14	...	1·17	4·61	...	4·48	2·22	4·48	...	...	1·15	...

CHILDREN of the LARWENCE MEMORIAL ASYLUM at MURREE during the 1878.

Each Month.												Total admissions during the year.		Admitted per cent. of strength.		Died per cent. of admission.	
July.		*August.*		*September.*		*October.*		*November*		*December.*							
Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	1·58	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	7	1	8·33	1·58	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1·58	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1·58	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	1	1	1·19	1·58	...	...
...	1	1	...	1	2	1	...	1	...	...	...	6	8	7·14	12·70	...	...
...	1	1	...	1	2	1	...	1	1	...	...	14	13				

average strength.

...	1·56	1·17	...	1·28	3·22	1·28	...	1·25	1·75	...	...	16·67	20·63

APPENDIX NO. B.

Inspection Report of Rupar Jails.

From—*Sanitary Commissioner, Punjab.*
To—Secretary to Government, Punjab.

Dated 16th January 1879.

With reference to your endorsement No. 57 of 3rd instant, I have the honor to report for the information of His Honor the Lieutenant Governor, that I proceeded to Rúpar on the 8th—9th instant; and on the following day, in company with Dr. Dallas, Inspector General of Prisons Punjab, and Dr. Ferguson, Superintendent Rúpar Jail, made a careful inspection of the three several jails and the canal cuttings on which the prisoners are employed at work, and on the 10th proceeded with the Officers above named to inspect the Nalahgarh quarries, with the view of ascertaining whether the work would prove an advantageous change for the more sickly men of the prisoner gangs. On the 12th I returned to Lahore, and having now received various statistical records and statements bearing on the subject of this inquiry from Dr. Dallas and Dr. Ferguson, beg to submit the following report on the results of my inspection of the Rúpar Jail, and investigation of the causes of the recent unusually severe sickness and mortality, amongst the prisoners confined in it.

2. The Rúpar Jail was first established in the latter part of 1869, as an experimental measure for the employment of prison labour on out-door work, and the prison now known as the "Second-mile Jail" was occupied on the 6th November of that year. Its licensed capacity, at the rate of 36 superficial and 450 cubic feet per head, is for 632 prisoners, namely—

In Barracks	576
In Solitary Cells	16
In Hospital	40
Total ...	632

In the beginning of 1873, a second Jail, on the same plan, and of the same capacity as the first, was completed, and occupied on the 21st January of that year. It is situated a mile nearer to the head works of the Canal, and is now known as the "First-mile Jail." Both these Jails are situated close upon the east side of the Sirhind Canal cutting which runs from north to south.

In the following year a third Jail was completed and occupied on the 16th March 1874. It is known as the "Third-mile Jail," and differs from the other two only in capacity and situation, it's general plan and construction being the same. Its licensed capacity, at the rates before stated, is just double that of either of the others, or equal to both together, that is, for 1264 prisoners. Its situation is close on the west side of the canal cutting, at a mile to the south of the "Second-mile Jail." It is important to bear in mind this difference in point of situation, as it will be seen further on, that this has much to do with the origin of the sickness, which has recently appeared amongst its inmates, although, until last year, it enjoyed the reputation of being the most healthy of the three jails here.

The united capacity of the three jails is for 2528 prisoners, and it does not appear that they have been at any period subjected to overcrowding. Nor—with the exception of 1871, in which year there were 48 deaths (35 of the number being from diarrhœa, fever, pneumonia and dysentery) in the 2nd Mile Jail, giving a ratio of 8·83 per cent. of strength—do the annual returns show any unusual prevalence of sickness and mortality, until the year 1877. These points will be seen by reference to the subjoined tabular statement of the average strength and mortality in each jail from first occupation to the close of last year.

Tabular statement of average annual strength and total mortality in the Rúpar Jail for the years 1870 *to* 1878 *inclusive.*

Years.	First-mile Jail, capacity 632.				Second-mile Jail, capacity 632.				Third-mile Jail, capacity 1264.				Remarks.
	Average strength.	Total mortality.	Admissions to Hospital.	Ratio per cent. of deaths.	Average strength.	Total mortality.	Admissions to Hospital.	Ratio per cent. of deaths.	Average strength.	Total mortality.	Admissions to Hospital.	Ratio per cent. of deaths.	
1870 ...	...	...	...	...	386·55	12	349	3·10					
1871 ...	...	...	...	...	543·37	48	715	8·83					
1872 ...	...	...	...	...	491·19	15	1,494	3·45					
1873 ...	1st & 2nd	mile	jails com	bined	895·90	53	3,809	5·91	No separate Hospital records were kept during these years. Hours of labour from sunrise to sunset. The Diet scale was altered and reduced on 28th February 1878.				1st mile Jail opened 21st Jan. '73 2nd „ „ „ 16th Nov. '69 3rd „ „ „ 16th Mar. '74
1874 ...					1,875·50	58	3,528	3·09					
1875 ...	All three	jails	combine	d	1,955·00	64	4,867	3·27					
1876 ...					2,006·00	120	8,413	5·98					
1877 ...	572·19	27	2,306	4·70	463·44	46	2,405	9·92	941·61	86	3,506	9·13	
1878 ...	586·23	84	2,983	14·32	595·75	92	3,092	15·44	1091·78	315	6,359	28·85	

Separate hospital records were not kept previous to 1877, so that there are no data from which to form any correct conclusion as to the relative healthiness of the several jails. The ratio of mortality, however, for the three combined, is less than that of the Second-mile Jail, which was the only one in existence here from 1870 to 1873. And of the two first years from 1874 to 1876 it is less than, and for the third year about equal to, the death ratio of the First and Second-mile Jails together for 1873. Hence it would appear that from the years 1872 to 1876, there was not much difference in the health conditions of the three several jails, though the Third-mile Jail, which was occupied in March 1874, has been generally considered to be the most healthy up to the end of 1876 ; but there are no data in support of this supposition. The Second-mile Jail (which was the first built here) during the first three years of its solitary existence—1870 to 1872, shows an aggregate death ratio of 15·38 against 12·34, the aggregate death ratio of the three jails combined during the last three years of the series from 1870 to 1876. The sickness and mortality in this single jail during the first period above mentioned, is explained by the circumstances of the time and occasion. The jail was then not so thoroughly well organized as it was afterwards, whilst the employment of the prisoners on this canal work was an experiment; the teachings of which were learned only by experience. And it is satisfactory to find that the various measures, from time to time adopted, have resulted in a very marked diminution of mortality between 1872 and 1876.

The First-mile Jail, occupied in January 1873, is also considered to have been very healthy, but there are no data in support of the belief, at least up to the end of 1876.

From the commencement of 1877 separate hospital records have been kept for the three jails. And they show a very marked difference in their respective health conditions as compared with previous years: a difference which requires explanation and careful attention, for it is more apparent than real as far as the First and Second-mile Jails, on the east side of the canal cutting, are concerned—because the causes of sickness are not in these Jails themselves, but in the work on which a certain proportion of the prisoners from these two jails are employed—whilst it is altogether very real as regards the Third-mile Jail of which I shall treat separately further on.

This is clearly made out by the Inspector General of Prisons, in his Inspection Minutes on the Rúpar Jail dated 29th January 1878 and 11th November 1878, and by the Superintendent Rúpar Jail in his letter No. 942 dated 4th October 1878, to the Inspector General of Prisons, Punjab, copies of each of which are herewith annexed.

By reference to Table IV accompanying the Superintendent's letter above referred to, it will be seen that the increased sickness in the First and Second-mile Jails, was the consequence of employing gangs from each of those Jails in the Third-mile cutting—a part of the canal works on which the prisoners of the Third-mile Jail are wholly employed. The nature of the work in this cutting and its injurious effects upon the health of the prisoners employed upon it, are fully described by both Dr. Dallas and Dr Ferguson ; and the latter in Table V of his letter above mentioned, has furnished a statement of the prevalence of enlarged spleen amongst the prisoners of the three jails separately, showing a very marked preponderance of the disease in the Third-mile Jail. The statement does not specify whether those affected by the disease in the First and Second-mile Jails were prisoners employed on the Third-mile cutting, though it is most probable that many of them were so employed.

It will be seen by reference to the tabular statement of average annual strength and total mortality in the Rúpar Jail for the years 1870 to 1878 inclusive, given on page 3 of this report, that there has been a sudden and great increase of sickness and mortality in the three jails here during the last two years, an increase of both which has been progressive up to the end of last year. The causes of this increased sickness and mortality have been described by the Inspector General of Prisons, Punjab, and the Superintendent of the Rúpar Jail, in the papers annexed to this report, and I fully agree with the opinions expressed by those Officers as far as they go, but causes have come into operation since those papers were written which in my opinion have tended to increase the sickness in the Third-mile Jail, and in the prisoner gangs of the other two jails employed upon the Third-mile cutting during the last three or four of the months of the past year especially. This I shall endeavour to make clear as I proceed with this report of my inspection and investigation.

I found each of the three jails in a scrupulously clean and orderly condition throughout, and the conservancy arrangements perfect ; glazed ware utensils being used in the latrines which are worked on the dry earth system, and most successfully. The sleeping barracks, several of which in each jail were used as Hospital-wards, were well kept and wholesome, but in my opinion they are over ventilated, especially in the First and Third-mile Jails. In all the three jails the barrack gratings are of wood, and are provided with no other means for keeping out the night air than a hanging curtain of coarse sackcloth. In the Second-mile Jail these gratings are of half size, but in the other two they are of full size and reach down to the sleeping berths, some of which are built up immediately in front of the grating. It would be an improvement to close up the lower half of these gratings with a temporary wall of bricks to be removed on the approach of the hot weather. The change was ordered by the Inspector General of Prisons to be put in hand at once, at the time of my inspection.

The cook-houses were in excellent order, the food well cooked and of good quality, though I think the meal (wheat) might be more finely ground with advantage to its digestion. The diet of the prisoners at the time of my inspection was on the old scale, which had been reverted to since the 1st of the current month. But from the 1st March to the end of 1878, the new scale of diet had been in use. I annex a detail of the old and new diet scales.

Old Diet scale in chittaks = 2 ozs.

Days.	Wheat.	Dal Urd (Phaseolus radiatus).	Dal Mung (Phaseolus mungo).	Vegetables.	Meat.	Ghi (clarified butter).	Condiments.	Parched Gram.	Gur * (unrefined sugar).	Remarks.
Monday	15	...	...	4	4	¼	½	2	2	* The Gur ration is served to those only who do their tasks.
Tuesday	15	3	...	...	...	...	½	2	2	
Wednesday	15	...	...	4	4	¼	½	2	2	
Thursday	15	...	3	..	...	...	½	2	2	
Friday	15	3	...	...	...	...	½	2	2	
Saturday	15	...	..	4	4	¼	½	2	2	
Sunday	15	...	3	...	...	...	½	2	2	

New Diet scale in chittaks = 2 ozs.

Days.	Wheat.	Gram * (a kind of pulse).	Dal Urd.	Dal Mung.	Vegetables.	Meat.	Ghi (clarified butter).	Condiments.	Parched Gram.	Gur †	Remarks.
Monday	15	...	..	1½	4	...	¼	½	2	2	* Given as meal in the bread. † Given to those who do tasks.
Tuesday	10	5	1½	...	...	...	...	½	2	2	
Wednesday	10	5	...	...	4	4	¼	½	2	2	
Thursday	10	5	...	1½	...	...	...	½	2	2	
Friday	10	5	1½	...	...	...	...	½	2	2	
Saturday	10	5	1½	...	4	...	¼	½	2	2	
Sunday	15	...	...	3	...	...	...	½	2	...	

This last scale was the one used during ten months of the year 1878, and was favorably reported on by the Superintendent, who found that the majority of the prisoners tested had increased in weight during six months of its use, as is shown in Table II of his letter attached to this report. I was much struck with the healthy and robust look of the prisoner gangs of these jails, and even many who were under treatment for enlarged spleen bore no signs of deficient food. On the contrary, the whole of the prisoners, except those seriously ill in Hospital, taken together, were as fine and well nourished a set of men as is to be found in many a regiment of Native Infantry in this Province.

The clothing of the prisoners is good, warm, and in ample quantity. Each prisoner wears a loose coat of coarse thick cotton, and an under shirt of the same material, together with an over shirt of thick blanket cloth which reaches to the knees. Besides these he has three blankets, one of which is of thick texture, and his bed is of a sackcloth mattress spread on a thick mat of crushed reeds. Altogether the prisoners in this jail are much better clad than the free labourers I saw on the works; they are also much more comfortably housed, and I think they are physically a superior set of men. Those in Hospital also had the benefit of fires during the night. In fact, they are very carefully and assiduously attended to by the Superintendent, and no pains are spared in watching over their welfare.

The water-supply of the jails is from a single well in each of them. They are in good order and well kept, but their contents are evidently not of uniform quality. In the wells of the First and Second-mile Jails the water is perfectly clear and bright, but in that of the Third-mile Jail, as well as in the wells in its vicinity on that side of the canal, it is very turbid and has a distinctly greenish hue. It is to the quality of the water in these wells, in and about the Third-mile Jail, that much of the sickness during the last four or five months is to be attributed, as will be seen further on.

The depth of the First-mile Jail well is 38½ feet from the top of its parapet to the bottom of the well. The parapet itself is 3 feet high, and the depth of water in the well is 3½ feet, and the depth of the canal cutting at this point is 25 feet.

The depth of the well in the Second-mile Jail is 35 feet, including 2½ feet height of parapet and 3 feet depth of water. Its distance from the canal is 600 feet, and the depth of the canal cutting is 36 feet.

The well in the Third-mile Jail is 28 feet deep including 3 feet parapet height, and 8 feet depth of water. It is 700 feet distant from the canal which is at this spot 29 feet deep, and now contains 9 feet of water.

In April last, I understand that this well was 18 feet deep, and contained 3 feet of water, but as the excavation in the canal, at that time dry, proceeded, its water ran short, and so a new shaft was sunk inside the original tube to a depth of 10 feet, and the water then stood in the well to a height of 11 feet. After a while it gradually sank to 5 feet; but since September last, when the canal cut became flooded, it has risen three feet in consequence of the rise of the water in the canal, and now stands at 8 feet.

The water of this well was in use by the prisoners up till the 25th December last, but since that date it has been discontinued, and the water of a well in the Sugh-nala, a few hundred yards to the south of the jail, has been used in its stead. The Sugh-nala well is 29 feet deep and contains 11 feet of water, which is distinctly turbid and tinged green, though not to the same extent as the well inside the jail. The water in the Sugh-nala well stands 8 feet higher than the level of the water in the canal, and extends 3 feet below the surface level of the water in the canal. The well is situated a few hundred yards to the west of the line of the canal, opposite a part which has not yet been excavated, in order to give passage to the bed of the nala. Besides this well, there is a third in front of the entrance side of the jail It is used by the police guard, and its water is even more turbid and greenish

than that of the well inside the jail. The water of all these three wells has a flat and disagreeable taste, and is loudly condemned by the natives. I have suggested that samples of the water of each of these three wells, together with some of that from the flooded canal cutting, as well as samples from the First and Second-mile Jails, should be forwarded for analysis and report to the Chemical Examiner Lahore, and in the meantime recommended that none of the water on the west side of the canal be on any account used for alimentary or even domestic purposes, as it is evidently marsh water. Dr. Dallas is of the same opinion as to the necessity of prohibiting the use of this water, and has instructed the Superintendent to arrange for the supply of the Third-mile Jail with drinking water from the wells on the other side of the canal cutting.

Before proceeding to describe the causes that have operated to deteriorate the well water on the west side of the canal cutting, I propose here to notice the general increase in the sickness amongst the prisoners during the last two years, as it will serve to show the extent to which the progress of the excavation work has affected their general health standard, and add weight to the recommendations I shall have to make for their protection in the future. I may state here, however, that the sickness and mortality has not been confined to the prisoners alone. The free labourers have also suffered very severely, and the Canal Officers have experienced great difficulty in keeping them for any time on the works, but there are no data available for arriving at any conclusion as to the amount or nature of the suffering amongst them. Some idea however may be formed on this point from the data available regarding the sickness amongst the jail guard's establishment during the past 4 or 5 months.

It appears that out of an average total of 360 men employed at the three jails as guards and jail subordinate staff, on the average 22 have been on the sick list and 8 have died. All the deaths, with the exception of one which occurred at the First-mile Jail, have occurred amongst jail guards and police constables employed at the Third-mile Jail.

It will be seen by reference to the tabular statement on page 1 of this report, that the total mortality for 1876 was 120 out of an average strength of 2006; that in the following year it rose to 159 with an average strength of 1977; and that in 1878 it increased to 490 (nearly two-thirds of which occurred in the Third-mile Jail) out of an average strength of 2274.

The subjoined statement shows the average strength and sick and mortality in each jail by months for 1878.

Statement of average strength and average sick and total mortality in each of the Rúpar Jails by months for 1878.

Months.	*First-mile Jail.*			*Second-mile Jail.*			*Third-mile Jail.*			Remarks.
	Average strength.	Average sick.	Total deaths.	Average strength.	Average sick.	Total deaths.	Average strength.	Average sick.	Total deaths.	
January	563·56	37·58	4	579·50	97·12	4	1,043·32	109·73	13	
February	676·75	58·21	1	563·53	60·75	4	1,142·75	128·53	8	
March	607·19	44·00	4	562·93	71·03	3	1,228·00	144·99	10	
April	632·02	63·12	8	598·66	89·61	8	1,263·73	277·17	22	
May	616·22	87·12	9	654·87	127·53	7	1,193·61	348·61	21	
June	596·16	68·26	6	606·56	78·18	3	1,084·36	329·41	16	
July	534·06	48·93	5	632·54	76·02	4	1,049·52	207·60	14	
August	621·06	53·26	6	614·06	74·70	9	1,146·93	162·60	8	
September	616·46	101·10	2	607·76	106·60	11	1,112·02	257·80	21	
October	580·06	178·89	16	614·22	177·71	15	1,079·00	384·21	36	
November	543·13	124·66	11	564·83	111·40	16	955·56	324·10	47	
December	527·93	102·19	12	543·19	83·06	8	869·32	294·40	99	

It shows that the sickness and mortality in all the jails rose suddenly in September, and more particularly so in the Third-mile Jail. This sudden increase does not appear to be due to the influences of the season, but appears to me to be attributable to special and local causes, with the first operation of which it is concurrent, and this view is supported by the death returns for the two preceding years, as will be seen by reference to the annexed statement, which shows that the total of deaths during the sickly season, [the last four months of the year] of the two preceding years, falls far short of that for the year 1878. This year, I am aware, has been characterized by an unusually heavy mortality all over the Province, if not of the whole country generally, but the causes which I believe have produced this extra and excessive Provincial mortality, do not apply in the case of the Rúpar Jail, where the prisoners are remarkably well off in point of clothing, food and shelter &c., and are physically a fine set of men.

Tabular statement of mortality in the Rúpar Jails, by months for the years 1876-77-78.

Months.	1st Mile Jail. Deaths.			2nd Mile Jail. Deaths.			3rd Mile Jail. Deaths.		
	1876	1877	1878	1876	1877	1878	1876	1877	1878
January	6	1	4	Included in the returns of the 1st Mile Jail.	5	4	Included in the returns of the 1st-mile Jail.	14	13
February	4	2	1		6	4		6	8
March	4	3	4		3	3		5	10
April	6	2	8		5	8		2	22
May	5	1	9		3	7		6	21
June	5	1	6		3	3		12	16
July	7	2	5		2	4		8	14
August	6	1	6		...	9		6	8
September	19	...	2		1	11		3	21
October	16	4	16		1	15		3	36
November	21	4	11		9	16		8	47
December	21	6	12		8	8		13	99

The increase in the sickness and mortality of the First and Second-mile Jails, as explained by the Inspector General of Prisons, in his Inspection Minutes before referred to, is owing to the employment of prisoner gangs from them on the third-mile cutting, upon which the prisoners of the Third-mile Jail were exclusively employed from August 1877 to August 1878; in September this sickness and mortality greatly increased, especially amongst the prisoners of the Third-mile Jail.

In this month of September the third-mile cutting of the canal, in which gangs from each of the three jails had been at work for months previously, became flooded, owing to the water in the cutting getting the upper hand of the engines employed to pump it out, and had to be left alone, a dam being thrown across the cutting so as to shut off about ¾ of the mile and thus allow the excavation to be proceeded with in the remainder. From that time to the present the water has continued to rise in the cutting above the dam at the rate of about an inch a day. At the time of my inspection it filled that portion of the bed of the canal cut to a depth of 9 feet, with a great sheet or pond nearly ¾ of a mile long of turbid and distinctly greenish water of very unwholesome appearance.

This water-submerged cutting is directly opposite the Third-mile Jail on its west side, and the distance from its west bank to the jail well is 700 feet in a direct line, as measured for me by the Deputy Superintendent, to whom I am indebted for the other measurements of this and the other jail wells. As before stated the depth of this well is 28 feet, including 8 feet water and 3 feet parapet, and that of the canal is 29 feet including 9 feet water. These figures, excluding the 3 feet of parapet in the jail well, would place the bottom of the well at 25 feet below the level of the ground, and 5 feet below the surface level of the water in the canal cutting on the date of my inspection, the 10th instant. The soil between the well and the canal is a loose and porous stratum of shingle, coarse gravel, and sand overlaid by clay in thin beds. The natural movement of the underground spring water is from the direction of the hills on the N. E. to the bed of the river Sutlej on the south-west, and in this course it meets the Jail well which is sunk on the west side of the canal. When the pumping was stopped the water in this well, which had previously stood at 5 feet, gradually commenced to rise, and at the time of my inspection stood at 8 feet, and in appearance exactly resembled that which had collected in the canal cutting, leaving no doubt in my mind that the two were one and the same in quality and source.

On the 25th December the Superintendent prohibited the use of this well water, and in its place used that from another well on the same side of the canal, as I have already described. Although I consider the Sugh well an extremely objectionable source of water-supply, still the change to it, as being less contaminated than the adjoining jail well, was followed by an immediate and marked diminution of sickness and mortality amongst the prisoners of the Third-mile Jail. This is clearly seen in the subjoined statement of admissions to Hospital and deaths in this jail, for the 16 days from the date of discontinuing the use of the well up to the time of my inspection, as compared with the 16 days immediately preceding.

Statement showing admissions to Hospital and deaths from all causes in the Third-mile Jail for the 16 *days preceding and following the discontinuance of the use of its well water on 25th December* 1878.

Diseases.	*27th December to 11th January 1879.* Admissions.	Deaths.	*10th to 26th December 1878.* Admissions.	Deaths.
Remittent fever	38	14	134	34
Intermittent fever	99	...	71	1
Pneumonia	2	2	6	4
Phagednic ulcer	1	3	9	6
Diarrhœa	6	5	34	7
Dysentery	1	3	4	3
Abscess	3	...	8	...
Albuminuria	...	...	1	...
Enlarged spleen	...	...	1	...
Colic	...	...	2	...
Opthalmia	...	...	1	...
Anœmia	1	...	2	1
Asthma	...	...	1	...
Bronchitis acute	...	...	1	...
Rheumatism Chronic	...	...	1	...
Otitis	...	...	1	...
Gumboil	...	...	1	...
Fissure of feet	4	...	...	...
Sprain of ankle	1	...	...	...
Total	156	27	278	56

The columns of "admissions" do not include all the men in hospital, but only the new admissions between the dates specified. The columns of "deaths" include all deaths occurring within the specified dates, irrespective of their being old or new admissions.

The statement shows an aggregate decrease in the first six diseases, which are those mainly affected by marsh poison, of 111 admissions and 28 deaths as the immediate consequence of the change of water.

These data are in my opinion sufficient to brand the water-supply as the prime cause of the excessive sickness and mortality in these jails, for there is not the least doubt that the prisoner gangs from the other jails working with those of the Third-mile Jail in the third mile cutting, drink the water of that cutting whilst at work in it, and thus become poisoned quite as effectually as if they were incarcerated in the Third-mile Jail and were dependent solely on its water-supply.

I inspected the hospitals and hospital barracks in each of the jails and carefully examined the patients. I found they were most assiduously attended to by Dr. Ferguson and his assistants, who spare no pains in caring for their comfort and treatment, and I don't think more could be done. At the time of my inspection, sickness was happily on the decline, but I found the greater portion of the Second and Third-mile Jail sleeping barracks converted into hospital wards. The Superintendent had classified the patients according to their diseases, thus separating ulcers, fevers, bowel complaints, pneumonia &c., one from the other, and all from convalescents.

Though several of the sick whom I saw were doomed to die, and many others had a very unhealthy look, and emaciated frame, the general appearance of those in the Second-mile Jail was not so decidedly unhealthy as that of the sick in the Third-mile Jail, in which the sickness was mostly from fever and enlarged spleen, the result of marsh poison. Subjoined is the morning report of sick on the day of my inspection of this jail.

Morning report of the sick in the Third-mile Jail hospital, on the 10*th January* 1879.

Strength of prisoners in the Jail—636.

Diseases.	Number.	Total.
Remittent fever	40	
Relapsing fever	24	
Intermittent fever	64	
Convalescents of remittent fever	16	
Ditto of Intermittent fever	30	
Pneumonia	9	
Bronchitis acute	1	
Bronchitis chronic	10	
Asthma	1	
Anœmia or general debility	7	
Diarrhœa	8	
Dysentery	4	
Ulcers	3	
Albuminuria	1	
Enlargement of spleen	23	241
Admitted on the 10*th January.*		
Diarrhœa	2	
Fever	14	
Sprain of ankle	1	
Abscess on sole of foot	1	18
Sick at 2nd Mile Jail Hospital	51	51
GRAND TOTAL		310

It will be thus seen that nearly half of the jail strength was on the sick list, and that, of the 259 in the Third-mile Jail, 211 were ill with marsh fever and enlarged spleen. To this number may be added the pneumonia, diarrhœa, and dysentery and anœmia cases, in all 30, as they are clearly the result of the action of the same poison as produced the fever, and we then have nearly the whole sickness attributable to one and the same cause.

The return is headed with 40 cases of remittent and 24 of relapsing fever. In reality, however, this disease is the same in both cases, the distinction being made in consequence of a relapse in a large proportion of them, and is not meant to indicate the existence in this jail of the true relapsing or famine fever. The fever now in this jail is a genuine marsh poison fever, and in many cases of a very malignant type, possibly owing to the thorough impregnation of the system with long continued and repeated doses of the poison. Many of the cases I examined bore a decidedly typhoid or asthenic character, and the Superintendent, who aptly designates them as "typho-remittent," informs me that in many instances the symptoms have much resembled those of enteric or gastric fevers; diarrhœa or dysentery, and occasionally jaundice early supervening as a prominent system; and inflammatory patches of the small intestines having been detected in some of the autopsies. But the fact of pneumonia also supervening in a considerable proportion of the cases, to my mind, stamps the disease as one of purely marsh poisoning, and I am inclined to consider the graver types which approach in resemblance to the symptons of enteric fever as merely aggravated forms of poisoning by decaying vegetable matter, much in the same manner as enteric fever is considered to result from poisoning by certain forms of decaying animal matter.

Dr. Ferguson has kept up a series of temperature charts of these fever cases which are most valuable records of the course of the disease, and I hope he will be able to give time by and by to tabulate them as a contribution to the medical literature of this country.

I have stated in the outset of this report, that I fully concur in the opinions expressed by the Inspector General of Prisons, Punjab, and the Superintendent Rúpar Jail, in their inspection minutes and report previously

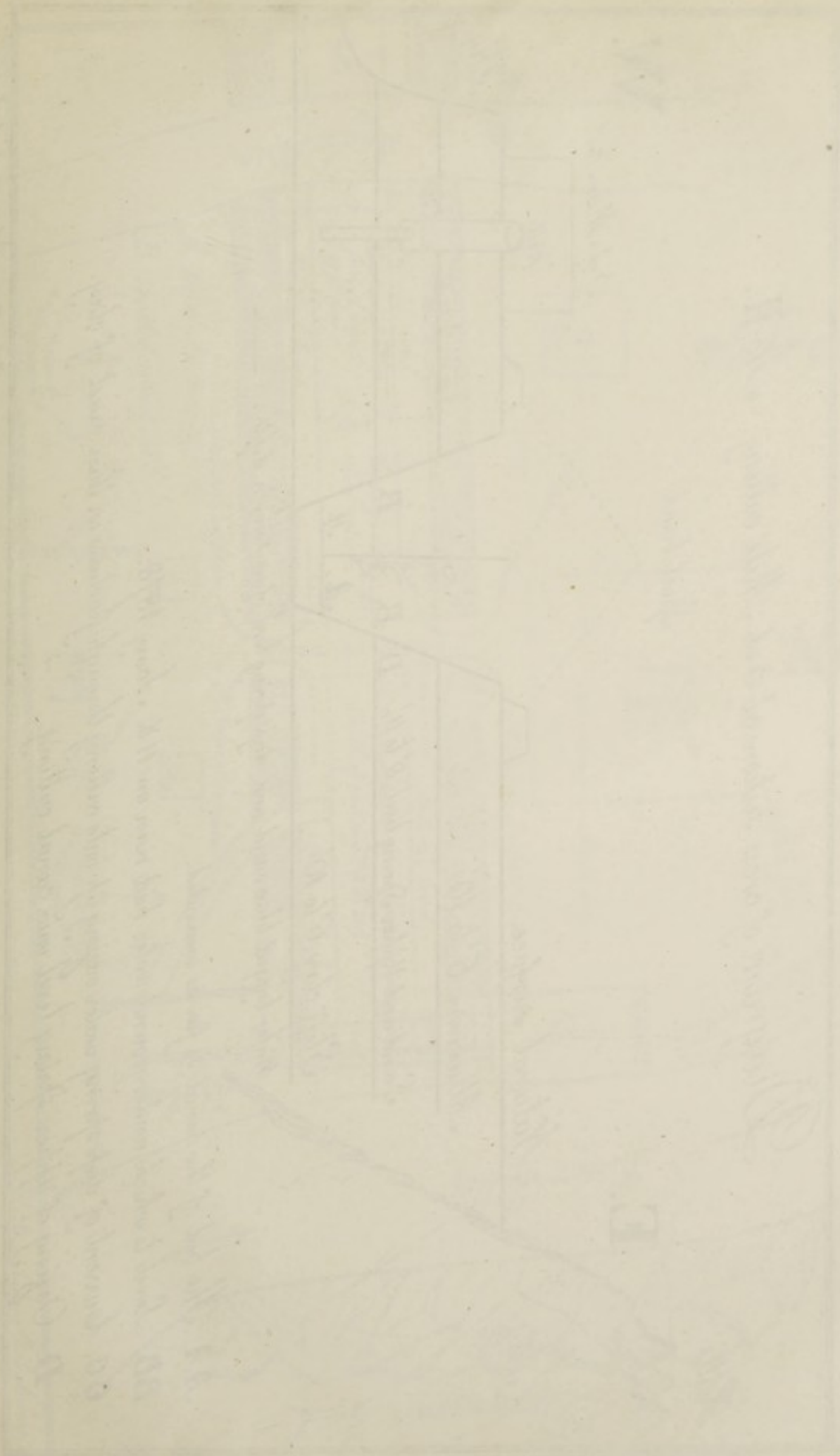
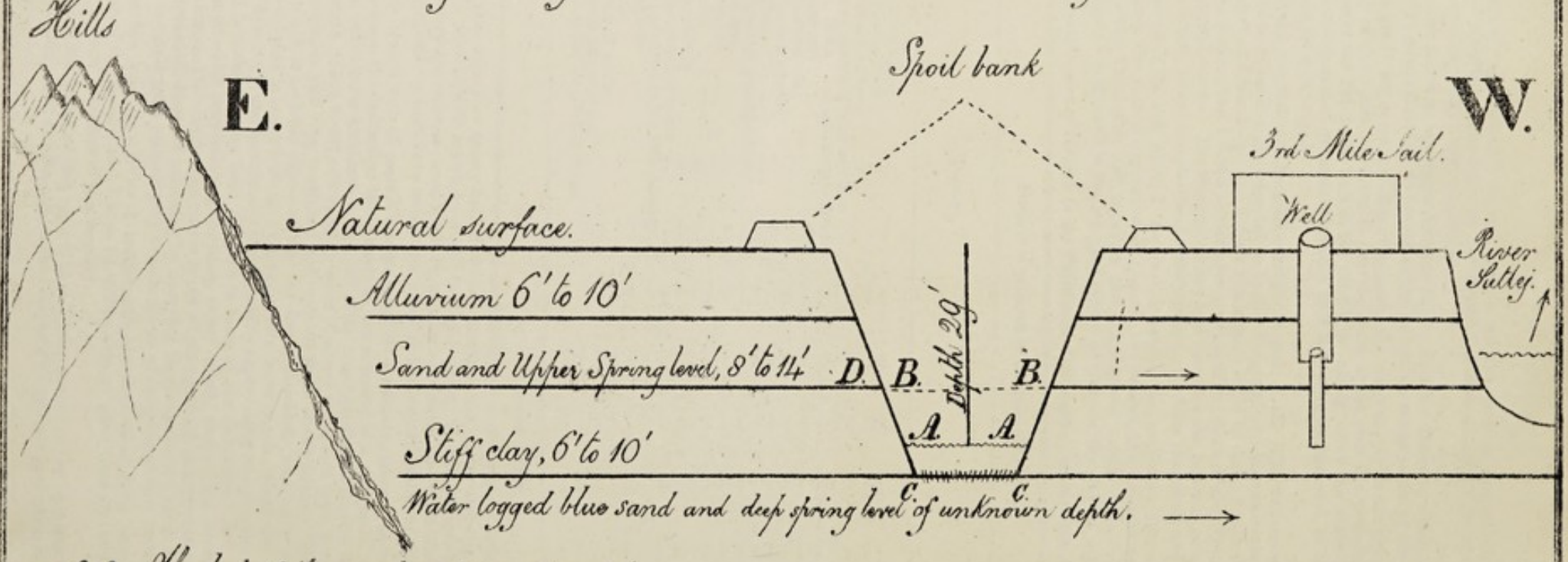


Diagram of cross section at 3rd Mile cutting. No: II.



A.A. The bed of the canal so far as excavated.

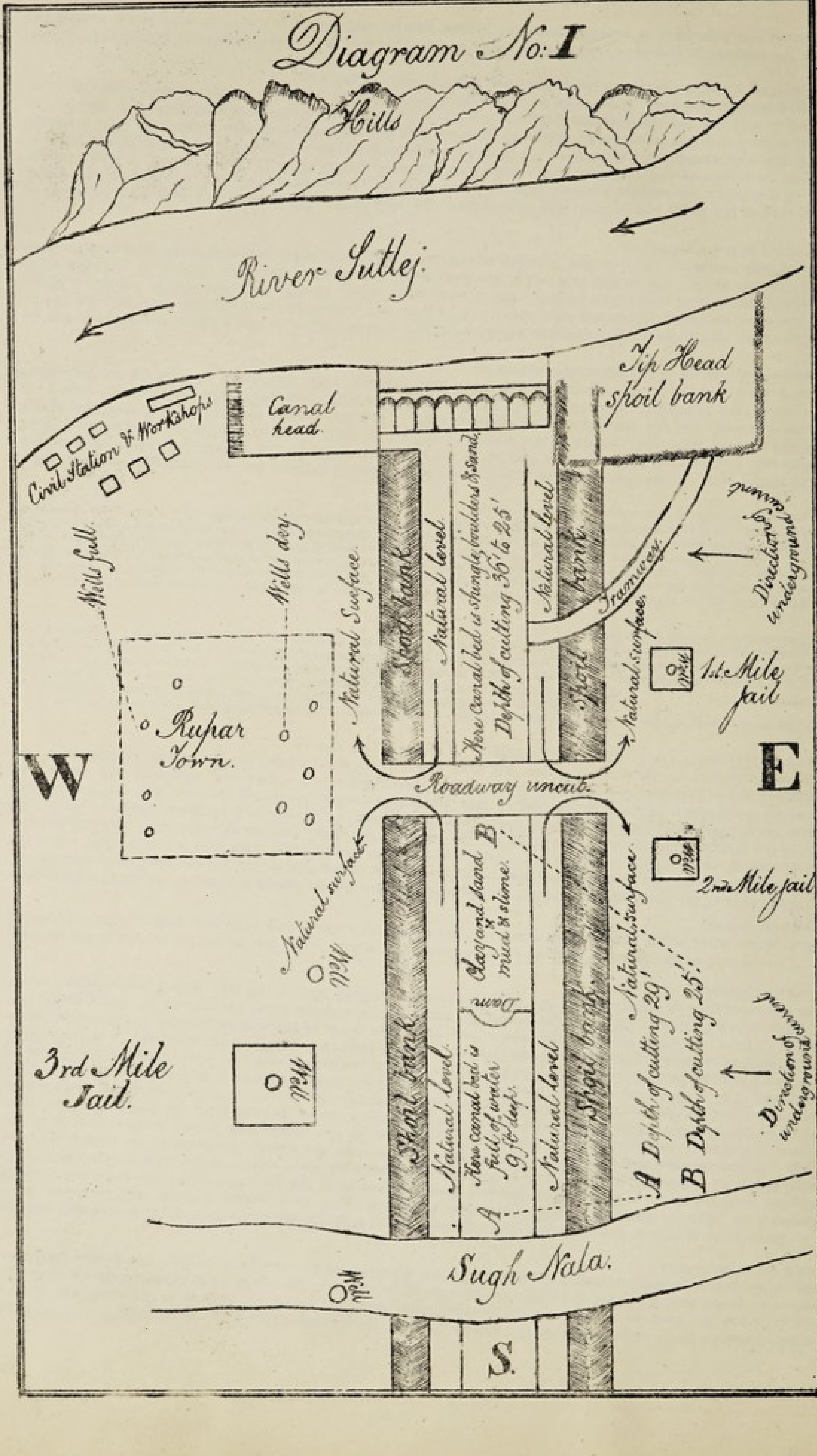
BB. Level to which underground water had risen on 11th Jany 1878.

C C. Current of deep spring water oozing up into cutting through fractures in thin crust of clay.

D. Oozing of Upper spring level into canal cutting.

350 Copies.

Litho. Press, Lahore Central Jail, 1879.



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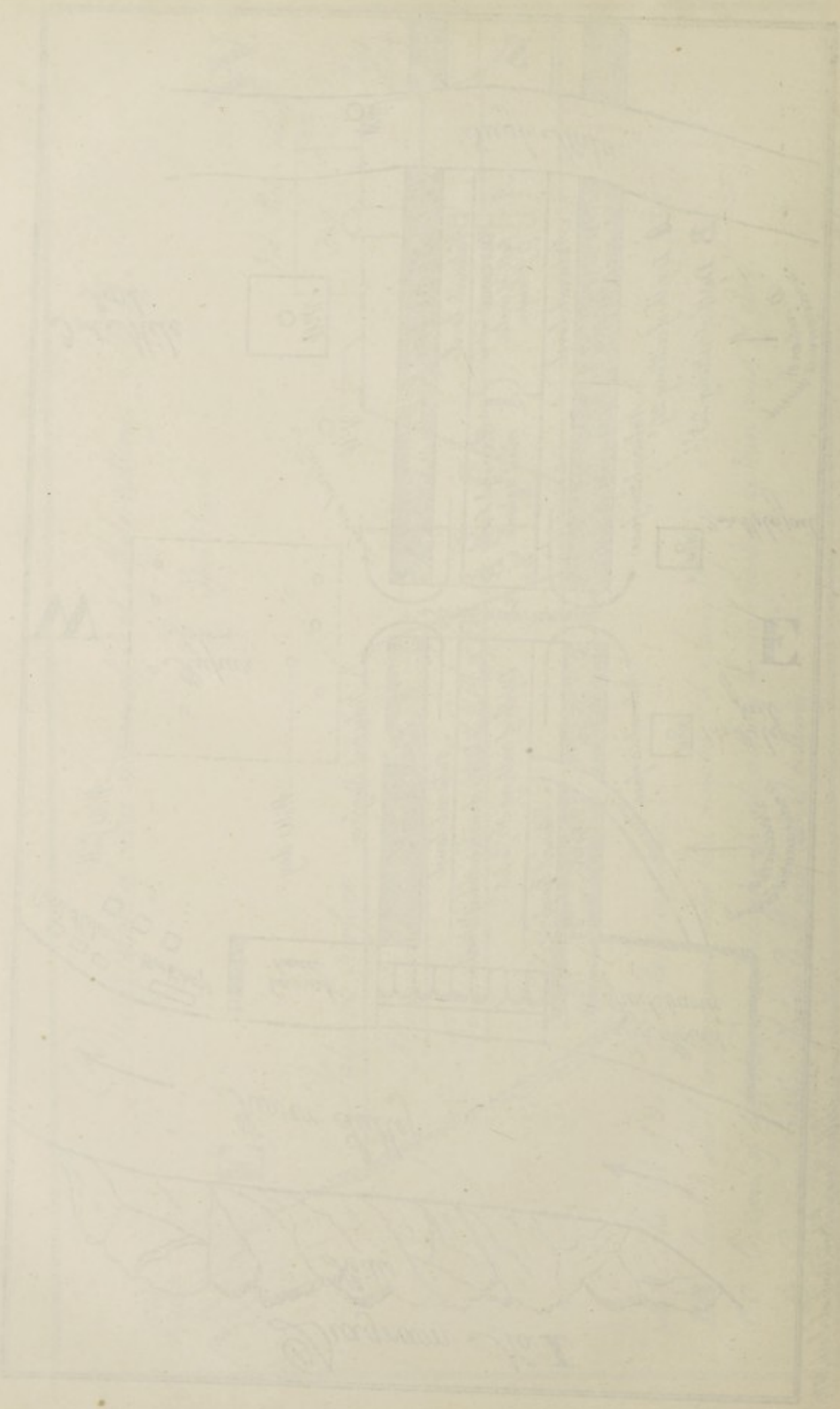


referred to and herewith annexed, as to the causes of the sickness and mortality in these jails being attributed to the nature of the work on which the prisoners are employed in the third-mile cutting of the canal, and I now proceed to enquire how it is that the works in this cutting should have produced such injurious effects upon the health of the prisoners employed upon them, whilst those equally deep in other parts of the cutting have produced no such ill consequences.

In order to approach this subject with a clear conception of the nature of the locality, it is necessary first to understand its physical topography and geological formation, and these points I think will be made more intelligible with the aid of a diagram showing the relative positions of the river Sutlej and the canal and the jails situated along its alignment, together with a 2nd diagram showing a cross section of the country at the third-mile cutting. In the annexed diagram, No. 1, I have attempted to show the relative positions of the several jails and the town of Rúpar along the line of the canal, and the position of the latter with regard to the river, with the object of illustrating the causes which have operated to affect the wells on its west side. It will be observed from the arrows indicating the course of the underground current, that the movement of the subsoil spring water is from the direction of the hills to the eastward towards the channel of the Sutlej river away to the westward, so that the wells of the First and Second-mile Jails in the line of this current, and on the east side of the canal, are not affected by the cutting, as are those of the town and the Third-mile Jail on its further or west side, although in all probability the depth of their water has been to some extent lowered by the depth of the cutting leading it into deeper levels. The depth of the First-mile Jail well, containing 3½ feet water, is 35½ feet below the surface of the ground, and that of the canal cutting opposite to it, 560 feet distant in a straight line, is 25 feet, with a water-logged bed of boulders and shingle.

The depth of the Second-mile Jail well, containing 3 feet water, is 32½ feet below the surface of the ground, and that of the canal cutting opposite to it and 600 feet distant in a direct line, is 36 feet, with a water-logged bed of shingle and sand.

The depth of the Third-mile Jail well was originally 18 feet, but as the excavation of the canal cutting proceeded deeper its water fell, so a new well was sunk 10 feet deep in the tube of the old one, and the well then contained 11 feet of water. This was in April of last year as before mentioned. This well is now 25 feet below the surface of the ground and contains 8 feet of water, the depth of the canal cutting opposite to it, and 700 feet distant in a direct line, being 29 feet, or 4 feet lower than the bottom of the well, as is shown in diagram No 2. So that, but for the accident of the canal cutting at this third-mile section becoming flooded, this well would have been drained dry as has been the case with those in the Rúpar town in the quarters adjoining the canal. In my Inspection Report on the town of Rúpar last year (page 141 Report on the Sanitary Administration of the Punjab for 1877) under the heading "water-supply," I stated as follows .—

Water-supply.

"The water-supply is from wells and ponds, and there is a small masonry tank in the suburbs on the south-west side of the town. There are altogether 68 wells in and about the town, but 18 of them in the eastern part of the town, next to the cutting of the new canal, have run dry, and most of the others contain only 6 or 8 inches of water which, when drawn, is very muddy, though otherwise considered sweet and wholesome. About five years ago when the canal cutting was first excavated, that water in the well nearest its course was observed to diminish, but since the deepening of its bed about 18 months ago, all these wells, with a few exceptions, have run quite dry. I measured 6 of the wells in different parts of the town."

"Their total depth varied from 27½ feet to 52 feet, according to the rise of the ground. The sarai well on the east side is 27½ feet deep including 1½ feet parapet. It has been dry for about a year. The Phulchakkai well on the opposite or west side of the town, is 30 feet deep including 7 feet water and 3 feet parapet. This well may be taken as representing the ordinary subsoil water level, namely 20 to 25 feet below the surface. The main cutting of the canal is fully 25 feet deep, and the excavation along its middle line, which contains a little water, is about 8 feet more, so that its action in draining the wells within reach is not difficult to understand. It is under consideration of the Municipal Committee to sink experimental shafts within the tubes of some of the dry wells, in view to tapping a lower stratum of water."

It seems clear to me that the third-mile cutting had in April last done for the Third-mile Jail well what the second-mile cutting had done a year or two before for the town wells in the vicinity of that section of the canal cutting. But after that period it did more and served to refill the well as a consequence of the altered conditions of the site and the disturbance of its natural state. The nature and consequences of these changes I will now endeavour to explain, with the aid of diagram No. 2 herewith annexed. The diagram is meant to illustrate a cross section of the country at the third-mile cutting, with the object of showing the geological formation and the results of the excavation across it.

The upper spring level or subsoil water stratum, which is that tapped by the wells of the country, lies in a bed of fine sand varying in thickness from about 8 to 14 feet. It is overlaid by an alluvial stratum, the thickness of which ranges from about 6 to 10 feet ; and it rests upon a bed of stiff impervious clay, which is from about 6 to 10 feet thick. Below this is a bed of fine blue sand of unknown thickness, but it is charged with water under high pressure. It is in fact the deep or artesian spring level, and is probably continuous with the subfluvial current of the river Sutlej.

So long as the upper spring level was undisturbed, the well of the Third-mile Jail remained intact at a depth of 18 feet below the natural surface. But as the work of excavation proceeded and the bed of the canal cutting was progressively lowered, it cut the supply from the well, and its water fell in proportion. Had nothing been done, the well would have run dry, as did those in the adjacent town when similarly treated by the excavation of the second-mile section cutting. In order to avoid this, however, the well was lowered 10 feet, a depth which sunk it well into the clay stratum and gave it a free supply of water from the lower levels into which the upper spring stratum had sunk, if not also to some extent from the deep spring stratum, latterly escaping into the canal cutting through fissures in the pared away layer of superjacent clay.

As the excavation proceeded through the depth of the upper spring level and penetrated into the clay below it, the cutting was kept clear of water by means of engine pumps, sufficiently to allow of work being carried on

without interruption. The cutting, however, was always in a sloppy state, and the sides soon became greasy and sliny with vegetable growth and decay, and constantly emitted faint and dank exhalations, now and then highly charged with sulphuretted hydrogen, whilst owing to the want of ventilation between the high banks on each side, the dissipation of these vapours was a very slow process. These are the evils which the Inspector General of Prisons and the Superintendent Rúpar Jail have very justly dwelt on as the causes of much of the sickness and mortality during the past two years in these jails. There is not the least doubt that the work in this cutting, (exposed as the prisoners were day after day for months together to these unwholesome exhalations and drinking, as there is no doubt they did, the water of the cutting,) has very injuriously affected the health of the prisoners employed upon it: but in the case of the Third-mile Jail, there is more than this work merely which has produced the severe and fatal sickness from which its inmates have suffered since last September up to the close of the year, as is I think clearly indicated by the figures of the tabular statements on pages IV and V of this report.

The figures of these statements point distinctly to a special local cause, and the nature of this cause is shown by the details of the statement on page V, to be simply marsh poison conveyed into the system through the water used for drinking. In other words the well of the Third-mile Jail (as well as those round about outside it) has been contaminated by marsh poison ever since August last, when the pumping operations on the cutting were stopped. By reference to the diagram No. 1 it will be seen that ¾ of the third mile section cutting is dammed off, as has been before explained, and contains a mass of water 9 feet deep directly opposite the jail. This water as I saw it had a most unwholesome look. It was turbid and highly charged with vegetable forms, which imparted to it a distinctly greenish hue, and in no way differed as to appearance from the well water of the jail. A reference to the cross section on diagram No. 2 will show how easily this water of the dammed up cutting can percolate into the wells on the west side of the canal, that being the natural direction of the spring current.

A. A. represents the bed of the canal as far as excavated, *viz.*, 29 feet from the surface. Until August last the water was kept down at this level by pumping. On the stoppage of this it rose by percolation through the side at D from the upper spring level and through the floor at C. C. from the deep spring level, till on the day of my inspection, 10th January, it stood 9 feet deep, indicated by the dotted line B. B. and is steadily rising at the rate of an inch a day.

From what has been stated it appears clear that the wells in and around the Third-mile Jail are past remedy, for so soon as the canal cutting is again pumped out they will run dry. It is necessary therefore to consider how the Jail is to be supplied with wholesome water. In my opinion no water should be taken for this purpose from the west side of the canal cutting, because the natural spring current is from east to west towards the river bed, and in this course it must first cross the bed of the canal, which is water-logged, and where not actually worked is covered with marsh and bog, full of rank vegetation and its decay. I would recommend that it be taken from the east side of the canal cutting, and laid on to the Third-mile Jail in iron pipes, after being first filtered at the First or Second-mile Jails. I should say the First-mile Jail is the safest source, because I observed that at the second-mile section-cutting water was rapidly rising in the bed of the canal, owing to the temporary suspension of pumping through an accident to the engines. Should this water accumulate here for any time, there is the risk of its contaminating the Second-mile Jail well by percolation, till overpowered by the natural underground current after repletion of the spring level, which at present is very low, owing to the cutting of the canal having drained the higher strata.

But wherever the water is drawn from on this eastern side of the canal cutting, I think it should be filtered before being used, and I would recommend the immediate use of filters in each of these jails. The filters introduced by Dr. Scriven in the Lahore Lunatic Asylum are simple and inexpensive, and have proved very efficient purifiers. They might I think be adopted with advantage in the Rúpar Jails. I understand it is the intention of the Inspector General of Prisons to reduce the period of labour of the prisoner gangs on the third-mile cutting from a month to a week at a time. This is a very good change, and if a week or two is allowed between each tour of work at this cutting, will, I doubt not, prove of great advantage to their health.

The gangs thus relieved at the third-mile cutting, might for the week or two, or till their turn for return to that work came round again, be employed at the Nalagarh quarries. I would strongly recommend this measure, because the air at Nalagarh is free from the faults of that about the canal cutting, and the change would benefit the health of the prisoners and enable them to throw off the evil effects of the week's exposure to the unwholesome exhalations from the canal excavations.

For the rest I can suggest no alteration in the general management of the jail, for, so far as I saw during my inspection, nothing could exceed the care and attention paid to the housing, clothing, and feeding, and indeed general comfort of the prisoners; nor could the prisons be kept in a cleaner or more tidy condition than I found them.

Copy of a letter No. 942 *dated 4th October* 1878, *from the Superintendent Central Jail, Rúpar, to the Inspector General of Prisons, Punjab.*

"I have the honor to submit a reply to your letter No. 998, dated 20th February 1878, regarding the result of the change of diet made in this jail, which was ordered therein, *viz.*, the discontinuance of a meat diet on two out of the three days of the week, on which it had been previously given, and substituting for it 1½ chittaks of dal.

"2. This change was introduced as you desired on the 1st March last, and the prisoners were carefully weighed as near to the same date as possible.

"3. I append three tables which contain all the information obtainable from figures regarding the success of the experiment.

4. "In table No. I the cost of the new diet is given as compared with that formerly issued. This is eminently satisfactory, as it shows a saving of Rs. 2,429-6-10 for the six months, or nearly Rs. 5,000 for the year.

"The prisoners were weighed on the first Sunday in March, that being the only convenient day in the week for the operation, as the men were then at leisure, and it would have taken them off work for a whole day at another time. As it was, every individual could not be weighed in one day, but I considered the number of 1,322 which we succeeded in obtaining, sufficient for the experiment. A record of each individual was kept and he was again weighed on the first available Sunday in September. The result as embodied in table No. II is also satisfactory; the majority of the men having increased in weight during the six months.

"I would now refer you to table No. III showing the admission into hospital during the same six months in 1876-77 and 1878 respectively, from which it will be seen that the number of sick has been nearly double this year of what it was in the same months of 1877, and higher than it has ever been before. In the face of the increase in weight generally among the men, the cause of this excess of sickness cannot be laid at the door of the change of diet. On the contrary, we may fairly conclude, that, but for this sickness which must have a specific cause, the improvement in the physique of the prisoners would have been greater than even now appears.

"I do not think the cause of the excessive sickness is far to seek, but is to be found in the work on which the prisoners are engaged. The attendance in Hospital has been gradually rising, in fact, as the excavation of the canal bed got deeper; and it showed a very marked increase in the beginning of last cold weather, or about the time when the work generally was down to spring level of the country. In April last with the advent of the hot season and the work in some parts well below spring level, the sickness increased suddenly, taking the form of dysentery and diarrhœa of a very fatal kind, in addition to the fever which previously existed. And the three jails were affected in a degree directly proportionate to the depth of the cutting in which they worked. For example, about 160 men out of 379 from the 1st Mile Jail were for months engaged in emptying wagons and worked on high and dry ground. About 250 of Second-mile Jail out of the total average of 376 on the works were engaged in filling these wagons in a part of the cutting at about spring level, while in the 3rd Mile prisoners were engaged for the whole of the same period in the lowest part of the cutting, considerably below spring level, and where the sandy soil in which they worked emitted a hot, damp, and in places, a decidedly fætid odour. I append a table No. IV compiled from the weekly return of sickness which I at your request forwarded to you during the most sickly part of the season.

"This shows, I think clearly enough, how far the work affected the prisoners. The condition of food, clothing, housing &c., of the prisoners are the same in all three jails, and if anything the Third-mile Jail used to be considered the healthiest, and the 2nd the least so, but the table shows what the nature of work would lead one to expect, *viz.*, that the prisoners of the three jail, have been during the last hot season, sickly, in direct proportion to the nature of their work.

"If any proof is wanted that malarial poison is the cause of the excess of sickness during the last ten or twelve months, it is to be found in the prevalence of enlarged spleen among the prisoners. I append therefore table No. V showing the result of a careful examination I made of the spleen every prisoner had in each jail within the last fortnight, and this shows a percentage of enlarged spleen in all the jails, but especially in the 2nd and 3rd. I beg you to notice also the relative proportion of diseased spleen in each of the jails, which appears to bear out remarkably what I have stated above regarding the healthiness of the work in relation to its depth from the surface.

"The extreme sickness abated to some extent when the rains began, because, in my opinion, the prisoners were then taken out of the cutting and put on general work, as repairing banks &c. I observed the same thing to happen in 1877. Now, however, with an excess of sickness among the free population, which is seriously felt by the Canal Officers in the difficulty they have in obtaining labor, the attendance in the jail hospital has risen, and threatens to be higher than it ever was before.

"I see no remedy for this state of things, so long as the present work remains to be done; but, in my opinion, it may be greatly modified by the transfer to their own jails of those prisoners who have become distinctly below par as regards health. It is these men who mostly fill our hospitals and many of them have been either in the convalescent gang or the hospital for many months together. I feel certain that I have now three hundred men or more whom it would pay the Jail Department to retransfer to their own jails. For,

"1st, the Canal Department suffers by getting no work out of them;

"2nd.—The extra diet they get in this jail makes their keep more expensive than it would be in their own jails;

"3rd.—Being so frequently in hospital there is a much larger expenditure of medicines &c., on their behalf;

"4th.—They earn nothing or next to nothing here, whereas they would be able for the light labor of their own district jails till the change of air recruited their health for;

"5th.—It is every way probable that their health would improve elsewhere; whereas there is even more than a possibility that many of them will die in this jail. I feel confident that the removal of these men would greatly reduce our death rate, while it would not raise that of the district jails to a material extent;

"6th.—The road expenses that these men get on release would go a long way towards paying for their transfer were they to be sent away in gangs.

"7th.—They could be sent in the prison vans which bring fresh prisoners, and the same police guard would do.

"8th.—Their places in this jail could be filled up with strong and healthy men, with profit not only to the Jail, but also to the Canal Department, and hence to Government generally.

"I trust this suggestion will receive your favorable and speedy consideration."

TABLE No. II.

Comparative Statement of Weight of Prisoners at the Central Jail, Rúpar, taken in September 1878.

JAILS.	Total No. of prisoners weighed on 1st March.	Total No. of same prisoners weighed on September 1878.	Total No. of prisoners increased in weight.	Total No. of prisoners decreased in weight.	Average gain in pounds per head.	Average loss in pounds per head.	Percentage of men who gained.	Percentage of men who lost.	REMARKS.
1st Mile Jail ...	478	214	169	45	3·44	3·03	78·97	21·02	
2nd Ditto ...	374	256	137	119	7·24	8·23	53·51	46·48	
3rd Ditto ...	470	304	164	140	7·32	7·31	53·94	46·65	

TABLE No. III.

Comparative Statement showing the Admissions into the Hospitals during six months of 1876, 1877 *and* 1878.

Years.	ADMISSIONS INTO HOSPITAL FROM ALL CAUSES.							
	March.	April.	May.	June.	July.	August.	Total.	REMARKS.
1876	509	955	1,079	881	640	1,147	4,211	
1877	626	561	696	620	536	839	3,878	
1878	820	1,192	1,249	1,246	1,047	1,130	6,684	

* Note the fall in sickness in July when the rains began.

TABLE No. IV.

Showing the relation of sickness to the nature of the work on which the Prisoners were engaged. This record extends over a period of 6 weeks from 20th May to 2nd July.

Jails.	Daily average population of Jail.	Total admissions to the hospital during period of observation.	Percentage of admissions to the strength.	Average daily number of able bodied men employed in canal.	Daily average of sick in Hospital.	*Distribution of bodied men.*						*Detail of diseases.*				
						Average daily number employed in 2nd mile cutting.	Number admitted to the Hospital.	Percentage of admission to strength of men in 2nd mile.	Average daily number of men employed in 3rd mile cutting.	Number admitted to the Hospital.	Percentage of admission to strength of men employed in 3rd mile.	Intermittent fever.	Bowel complaints.	Chest complaint.	Surgical.	Other causes.
1st Mile Jail ...	587·80	315	53·59	279·69	76·76	154·22	78	50·51	125·47	140	111·58	165	43	20	76	13
2nd Mile Jail ...	608·65	357	58·94	376·27	117·52	265·34	233	87·71	99·31	41	41·27	163	76	6	60	50
3rd Mile Jail ...	1113·66	950	85·30	319·02	350·19	...	840	...	352 36	840	238·38	589	222	5	87	53

TABLE No. V.

Statement showing the prevalence of enlarged spleen among the prisoners.

Jails.	Population : on date of examination	No. out of Hospital on date of examination.	No. who had enlarged spleen.	Percentage of enlarged spleen.	No. in Hospital on date of examination.	No. who had enlarged spleen.	Percentage of enlarged spleen.
1st Mile Jail	561	468	31	6·62	93	19	20·43
2nd Mile Jail	643	547	104	19·01	96	24	25·00
3rd Mile Jail	1,098	838	192	22·91	260	75	28·84
Total ...	2,302	1,853	327		449	118	

Total percentage of enlarged spleen among able bodied men in all three jails ... 17·64
Ditto ditto among the sick ... ... 24·05

Extract para. 15 *from Inspection Minute of Inspector General of Prisons, on Rúpar Jail, inspected* 26*th to* 29*th January* 1878.

"Para. 15.—The health of the prisoners for 1877 has been bad. There has been during the year a daily average of 177·33 sick in hospital, out of a daily average of 1964·59 prisoners in jail, or 9·02 per cent. of the number of sick admitted; however, a large proportion, 26·9 per cent., came in for injuries received on their work. These injuries were of various kinds, some slight, such as bruises, contusions, &c., slight but requiring treatment, others not very numerous of a more serious nature, such as fractures of bones, the causes producing this class of patients may be said to be peculiar to this jail. Putting aside these cases there were 5,972 admissions into hospital from general diseases, of these 3,941 were from fevers, 701 from dysentery and diarrhœa, and 116 from pneumonia, and 97 from bronchitis the balance being from diseases of various and less important kind. The mortality was 159 or 8·09 per cent. of the average number in jail. The deaths were from fever 13, dysentery and diarrhœa 44, from pneumonia 33, from phthisis 12, from apoplexy 2, sunstroke 4, meningitis 11, the remainder were from various causes, such as albuminuria, cholera, rheumatism, paraplegia, laryngitis. The cases of meningitis were possibly in reality fever. The classes of disease which seem to me to call for special remark because of their influence on the sick list, the fatality attendant on them, and the light they may throw on the cause of the sickness during the year are fevers, dysentery and diarrhœa, and pneumonia. The admissions from fevers very nearly amounted to half the number of admissions into hospital from all causes including injuries (48,23 per cent.) but the mortality from this was very small, only 0·15 per cent. of admissions. The admissions from bowel complaints were the next most numerous, but there is a great difference between the numbers; the mortality, however, was much h igher, 6·27 per cent. on admissions; and lastly, the number admitted from pneumonia although very much fewer gave a far greater mortality, 28·45 per cent. Now I am much disposed to lay these cases of bowel complaint and pneumonia to fever as a cause. I do not mean that pure malarial fever produces this fatal form of pneumonia or dysentery, but I think that the frequent occurrence of fever debiltates the men to such an extent as to render them peculiarly susceptible and less able to resist the diseases with which the climatic changes they are exposed to attack them. The fever commences in the early autumn generally. At that time pneumonia and bowel complaints are not very numerous, but on the advent of the cold weather they rapidly rise; for instance, in October there were only two admissions from pneumonia, whilst in November there were 11, and in December 20, and in the current month (January 1878) the admissions have up to date reached 27; in the preceding Jannary there were 21 admissions again with bowel complaints. In September there were 47 admissions, in October 106, November 112, in December 112, and in the present month 83. In the year 1876 the prisoners suffered severely from fever; there were 5,998 admissions from this disease. I am disposed then to attribute much of the sickness to causes independent of the prison itself, but there are also causes which I consider much of the sickness may be fairly attributed to, and which are special to the prison. In the first place after carefully seeing the men of all the jails, I do not think that Superintendents make a proper selection of the men they send to this jail; there were certainly some fine stalwart men, the majority were such, but a considerable number were old and feeble men, utterly unfit for the hard labour they have here to perform: especially I noticed men sent from Hissar; these men ought never to have been sent here, any medical man should have known that they must break down with real hard labor, and as a matter of fact they are soon unfit for work and have to be placed on the very lightest labor, or in the infirm gang. Superintendents were addressd some time ago by me as to the necesity for sending none but robust men here, but the Superintendent complains that these instructions have of late been neglected, and that in some cases fit men have not been sent, and this especially from the lower part of the Province. Another cause affecting the health of the men in my opinion is the kind of labor they are engaged in, some part of the excavation work is damp, saturated with water, and in fact absolutely covered with water, so that the men are puddling about whilst at their work. This cannot but be prejudicial in a high degree to health, and I feel certain that to it much disease is due, but I see no remedy for it. short of absolutely removing the men from the work. There is, however, this to be said that this kind of work is nearly done. Then I think that the jails commenced the year (1877) at a disadvantage having suffered so severely from fever in 1876, and I think that the men should be most carefully selected for their work, and not be sent back to the hardest form of labor too quickly after having been in hospital; again the fixing of a proper task as the kind of labor varies, should be most carefully attended to. There is another point I ought to notice, a considerable number of injuries in this jail are self-inflicted in order to escape work."

Extract paras. 16 *to* 23 *inclusive from Inspection Minutes of Inspector General of Prisons, on Rupar Jail inspected* 7*th to* 10*th November* 1878.

"Para. 16.—The whole three jails can at 36 square feet per man accommodate 2,528 prisoners. The daily average duriug the year to end of October was 2,297. The highest number reached (on 18th April) was 2,629. On the day I began my inspection (7th), there were in the jail 2,125. The Superintendent has tents by which he may accommodate any excess above the number the barracks can hold, so that there was no crowding during the year.

"17. The health of the jail during the year has been unsatisfactory, and it is so now at the time of my inspection. The daily average sick during the year to 31st October, was 407·02, or a percentage of 17·72 on the daily average strength. The total admissions to hospital have been 10,862, and the deaths 298, or 12·97 per cent on the daily average. On one of the days of my inspection (the 7th), there were altogether 629 sick in hospital from the following causes:—

248	Intermittent fever.
27	Remittent fever.
1	Eysepelas.
4	Eye disease.
14	Pneumonia.
2	Acute Bronchitis.
59	Diarrhœa.
25	Dysentery.
2	Affections of the mouth.
2	Abscess.
156	Ulcers.
2	Fractures.
1	Gangrene.
77	Debility.

"Of the admissions from 1st January to end of October, the chief part has been from the following diseases :—

5402	Intermittent fever.	130	Pneumonia.
1308	Ulcers.	87	Acute Rheumatism.
1291	Diarrhœa.	94	Remittent fever.
566	Dysentery.		

"Of the deaths that have occurred, the following diseases have been the chief causes :—

Dysentery	104	Diarrhœa	61
Pneumonia	56	Remittent fever	27
Intermittent fever	11	Erysipelas	7

"18. In my last inspection report I stated it as my opinion that much of the sickness in the jail was due to causes in no way peculiar to the jail itself, and I again now repeat that opinion. It will be seen from what I have stated that the diseases here prevalent among the prisoners, and to which the great amount of sickness and mortality are due, are such as are prevalent in other jails from Delhi to Lahore, *viz.*,fever, dysentery, diarrhœ and pneumonia, but more than this they are common not only to this and other jails, but to the free population of this and other parts of the country and tothe jail population here.

"It is unnecessary for me to go into figures to prove this ; there is ample evidence to be found at Jullunder, Lahore and elsewhere, but I may add that the residents of Rúpar, Europeans and Native, the jail establishment, the police, and the free laborers, are also suffering severely from the same causes. I have been told by an officer of the canal, that out of 250 newly imported laborers at Nalagarh he had on the 9th only 70 able to work.

"19. But there are causes of ill health, or of the aggravation of disease in the jail itself ; and this is shown by a comparison of the different statistics of the different jails. Before, however, I go on to contrast these, I may at once say that I find no fault in the arrangements made by the Superintendent ; and the Deputy Surgeon General, Dr. Cannon when last inspecting this jail was of the same opinion. He says, "no pains are spared to provide every reasonable comfort for the care and cure of the sick." Another point to be noticed is the condition of the men sent here. Last time I reported that men very unfit for the work of this jail were received from other jails. Superintendents were addressed on this point, and stringent orders of Government conveyed to them. The result has been that only 15 men have been objected to by the Superintendent among the batches sent to him this year. The Superintendent sending these maintained, they were fit, and I myself examined them with Dr. Ferguson. Of the 15 he objected to, I found 8, I thought might be passed, and 7 rejected. These 7 should be returned to their own jails. This cause, special to the jail, has then in the present year been almost entirely removed.

"20. Of the 298 deaths which occurred, 61 were among prisoners in the 1st Mile Jail, 68 among prisoners in the 2nd Mile Jail, and 169 among the prisoners in the 3rd Mile Jail. The daily average strength of these jails being each as follows, from 1st January to 31st October :—

	Daily average.	*Admission.*	*Death.*
1st Mile Jail	588·21	2553	10·37
2nd ditto	595·46	2577	11·41
3rd ditto	1,113·10	5732	15·18

"Thus it will be seen that the Third-mile Jail has suffered the most severely. Now the conditions of the jails as regards clothing, food and other internal arrangements, are identical ; then we must look for some cause external to the jails to explain the difference shown above. The prisoners of the 1st Mile Jail have been employed to the extent of over half its strength emptying wagons at the tip head in a high, dry and airy position. The prisoners of the 2nd mile, to about three-fourths of the strength, were employed in filling the wagons ; their labor was in the second mile cutting about spring level. The prisoners of the 3rd Mile Jail were all employed in the 3rd mile cutting, their labor was between high banks in slush and mud and wet land, and at times on ground absolutely covered with water, being considerably below the spring level of the country.

"The air there, the Superintendent says, being always damp and not unfrequently fœtid, this then is, I believe, the cause of the great unhealthiness of that jail, and this is proved to my mind by the fact that whilst only 50·51 per cent. of the prisoners of the 1st Mile Jail working at the tip head were admitted to hospital ; 111·58 of the prisoners sent from the same jail to work at the 3rd Mile cutting with the prisoners of the 3rd Mile Jail, were admitted to hospital in the same period.

"21. During the year a change in the dietary of the jail was made, instead of meat being issued three times a week it is now given once a week only, and its place taken by dál on the other occasions. This change has exercised no prejudicial effect on the health of the prisoners. Of 774 prisoners weighed, 470 had gained weight under the diet, and 304 had lost weight, and I have heard no complaints from the prisoners as to feeling the want of the animal matter taken from them. I consider then that the change may be continued.

"The Superintendent has full discretion as to giving to the sick and weakly such extra diet as he may consider necessary for them.

"22. Among the whole body of prisoners there were several who looked anœmic, and of the men on the works 16·18 had enlarged spleen, (of the 3rd Mile Jail men 22·91 per cent.), but there were some remarkably fine strong men, and generally I think they were a better looking body of men than I saw last time I was here.

"The tendency among them for bruises of the slightest description to become unhealthy sloughing ulcers is very marked, and this I attribute to the blood poisoning, the result of malaria.

"23. I have already stated that the conservancy arrangements, the clothing and bedding, the food and the management of the jail, both generally and medically, are good, and I have no change in them to suggest in view to improving the health of the prisoners. I also stated in my last report that I was of opinion, so long as the men were employed on the damp wet work of the 3rd mile cutting, so long would their health be unsatisfactory. I think so still, and I would change the men frequently from this to other work. A certain number of men must, from the peculiarity of the work, always be employed on it, and we cannot change the men filling and tipping, in order that they may take their turn at the 3rd mile work, because men with some training are required, and

frequent changes would in all probability result in numerous and serious accidents, but on the work in the Boodkee nullah or super passage (about 2 or 2½ miles out from the 3rd Mile Jail) over which I went carefully, there might, I think, be found work which could be given to the prisoners ; a gang of prisoners might be taken there and back daily on trucks, and worked there for say a month, then be changed to the 3rd mile cutting, and the third mile gang be sent to the Boodkee, and after a month again changed, and so on. In this way the continuous exposure of the men to the unhealthy influence of the 3rd mile work would be avoided.

"I request the Superintendent will communicate with the Executive Engineer and arrange this, letting me know the details of the arrangement. I have seen Major Home here, and he thought there could be no difficulty whatever in getting the men to and from their work on trucks, and I have also seen Mr. Broodie, the Engineer in charge of the Boodkee works, and ascertained that he could employ the prisoners. This matter should receive immediate attention.

"24. The following statement shows the result of the analysis of the Rúpar Jail well water" :—

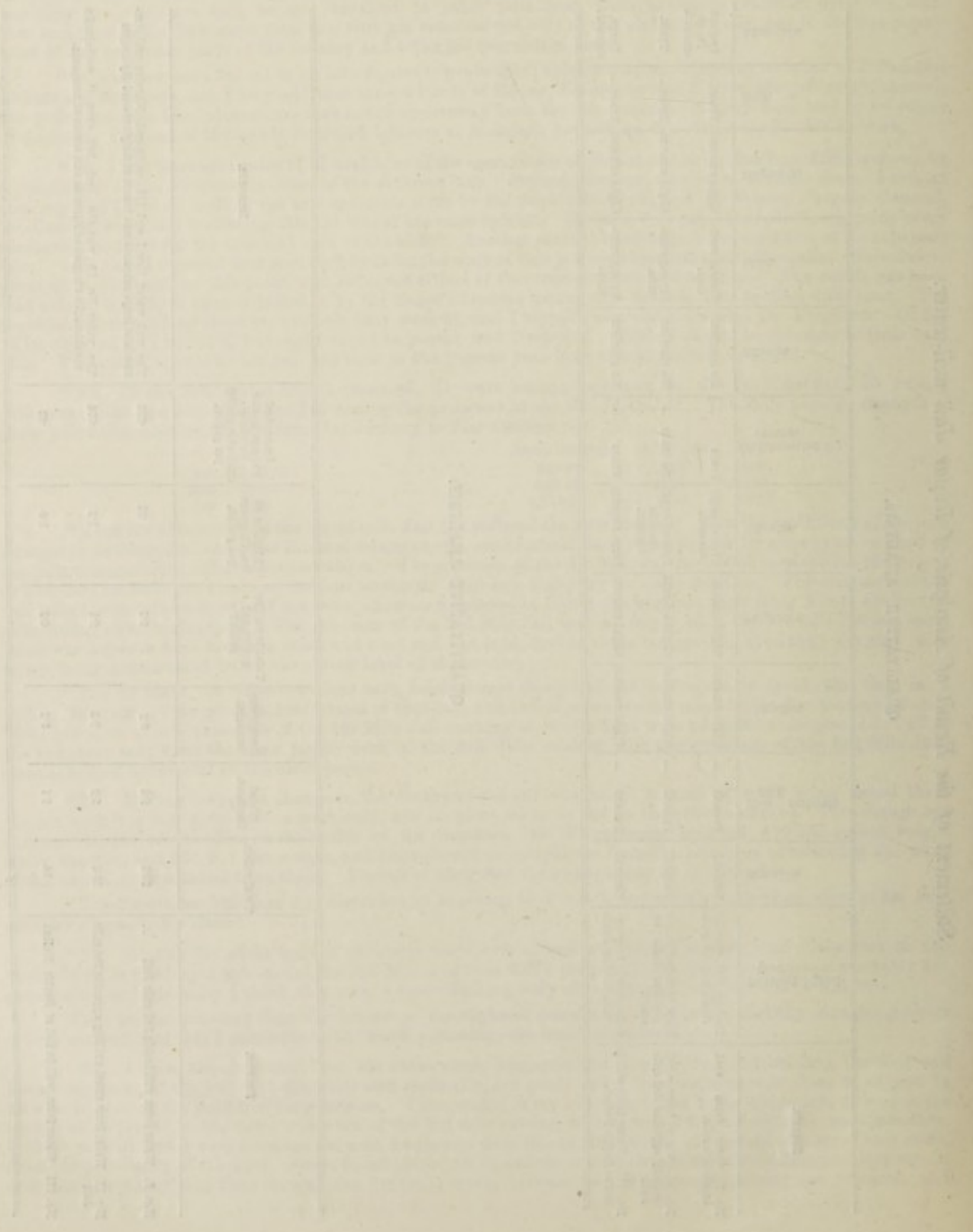
Statement of the Result of Analysis of Rupar Jail well-water.

QUALITATIVE ANALYSIS.

Sources.	Physical qualities.	Reaction.	Free carbonic acid.	Chlorides.	Sulphates.	Nitrates.	Sulphuretted Hydrogen.	Nitrites.	Lime.	Magnesia.	Iron.	Ammonia.
No. I. Water from well inside 3rd mile.	Darkish tint, marshy smell, slight deposit.	Neutral	Present ...	Slight amount	Slight amount	Present large amount.	Trace ...	No reaction	Strong reaction.	Slight amount	Trace ...	Present large amount.
No. II. Water from canal cutting opposite 3rd mile Jail.	Clear transparent, no peculiar taste or smell.	Neutral	Present ...	Slight amount	Slight amount	Present considerable amount.	No trace ...	No reaction	Strong reaction.	Slight amount	Trace ...	Trace.
No. III. Water from well in bed of Sookh Nullah.	Colourless transparent, marshy smell.	Neutral	Present ...	Slight amount	Slight amount	Large amount	Trace ...	No reaction	Strong reaction.	Slight amount	Trace ...	Large amount.

QUANTITATIVE ANALYSIS.

Sources.	Total solids.	Total hardness.	Permanent hardness.	Volatile matter grains per gallon	Chlorides as Na. Cl. grain per gallon.	Amount of oxygen grains for easily oxidisable matter per gallon.	Remarks.
No. I. Water from well inside 3rd mile Jail ...	23·8	9·4	3·2	2·8	·81	·026	The well water Nos. I and III contained Nitrates and Ammonia in large amounts and traces of Sulphuretted Hydrogen
No II Water from canal cutting opposite 3rd mile Jail	19·6	7·2	2·3	2·1	1·3	·014	The water No. II was the best but even it contained a considerable amount of Nitrates and traces of ammonia.
No. III Water from well in bed of Sookh Nullah	14	7·7	3·2	4·2	1·6	·03	



APPENDIX C.

Report of the Committee for the Inspection of villages within a radius of five miles of Rawalpindi Cantonments.

The Committee was constituted under instructions from the Government of India, Home Department, No. 6—220 of 3rd November 1877, to the Government of the Punjab, and in accordance with the directions of endorsement No. 809 of 1st March 1879, of copy of No. 808 of same date from the Secretary to Government, Punjab, to the Commissioner and Superintendent, Rawalpindi Division.

The first meeting was held on the 14th March 1879 at the temporary office of the Sanitary Commissioner in Rawalpindi, for the purpose of arranging the order of inspection and other details of the enquiry, the nature of which is indicated in paras. 3 and 4 of No. 218 of 3rd November 1877, from Secretary to Government of India, to the Secretary to Government, Bengal, as hereunder quoted :—

"3rd—The primary object in appointing these Committees is to ascertain, as a preliminary step to the best action practicable, what is the actual state of villages in the neighbourhood of cantonments, whether they are in reality a source of danger to the troops in cantonments, and whether, if the sanitary evils that may be found to exist in them are removeable, what measures are practicable for their removal, and what the cost of such measures will be. The attention of the Committee should be directed more especially to the drainage of the site of each village and of the ground around it ; to the sources of water-supply and their liability to pollution ; and to the general condition of the village in respect of cleanliness and conservancy. It will probably not be possible to introduce the use of latrines in villages, and in fact latrines are worse than useless when they cannot be under proper inspection, but the Committee might when inspecting villages, report what improved arrangements for conservancy are feasible. For instance, it would greatly conduce to the sanitation of villages if the cattle which, as a rule, are tied up inside enclosures, could be removed to a short distance outside the village. This change would no doubt be one of great difficulty for many reasons, and certainly could not be at once carried out, still with some trouble the objections to it might be gradually overcome. Care must of course be taken in any schemes of sanitary reform in villages around cantonments not to offend the prejudices of the villagers concerned. It is impossible for any Government Agency to keep villages clean, but the villagers may in time be educated to see the advantages of cleanliness. What is chiefly required is to prevent the people fouling localities near the sources of water-supply. A record of the actual state in these respects of the villages from which cantonment supplies are drawn would afford useful information to the military and civil authorities.

"4th—The Committee should be allowed to examine into sanitary measures within cantonments so far as these are connected with the subject of their enquiry, and should be directed to prepare estimates for carrying the objects suggested in paragraph 3 of this letter, especially as regards the water-supply. The Committee should also submit duplicate reports one to the Quarter-master General of the Army, and the other, through the Local Government, to this Department.

2. The map attached to this report, which includes the area within the prescribed limits, was traced from the map of the district prepared in the Quarter-master General's Department. For convenience the circle was divided into quadrants, and each of these was taken in turn.

17*th March* 1879.—The Committee met at 8 A. M., and proceeded at once to inspect the following villages with the results noted under the heading of each in succession :—

Adra.—Population 256; No. of houses 87 ; mostly built of mud. This village is situated close to the cantonment, and to the south-west of the British Infantry Barracks. It stands on the edge of a winding ravine which is one of an intricate series of drainage gullies that join a main channel, which ultimately empties into the Sohan river. The site of the village is open and elevated, and the ground around is cultivated quite up to the village huts. The crops now on the ground are wheat and barley in a forward state and of promising appearance since the recent rains. The soil is a light clay, and is naturally well drained into the adjoining ravine. There are no pits nor excavations about the village, and the village dung heaps are formed in the fields around at a convenient distance from the huts. In several instances these were too close to the village. The village itself was found to be in a remarkably clean and tidy condition, and wore a look of general prosperity and comfort. The inhabitants are Mussulmans and belong to the Adra and Kalyál sections of the Chobán tribe. They are occupied in agriculture, and furnish laborers for work in the cantonments.

The village has three wells. One of them is about 36 feet deep, and the other two about 24 feet each. The depth of water in each of the wells is about 8 feet, and it is considered sweet and good. There are no cattle ponds about this village.

Tayouch.—Population 523 ; No. of houses 127 ; all of mud except three which are of masonry. This village consists of two divisions situated about half a mile apart on opposite sides of an intervening ravine. The site of each village is open, and, though lower than that of the cantonment (to the immediate south of which this village is situated) is elevated in respect to its immediate surroundings, and is naturally very well drained by the ravine winding between them. The two divisions are of about the same size, and are occupied by Mussulman cultivators of the Adra, Dolál and Dhamyál castes. The division to the westward has one well, but that to the eastward has three. The wells are about 30 feet deep, and contain 6 feet of good, clear, sweet water in each. There are no ponds or deep excavations about either division, but there is a dung pit close outside one of the huts in the periphery of the western division. This pit should be at once filled in by ploughing the ground around into it. The ground about each division is occupied by corn fields quite up to the huts, and dotted about amongst them are the village dung heaps. The village generally is in a remarkably clean and tidy condition, and its people appear prosperous and comfortable. Every house has its three or four or more head of horned cattle. These are usually housed in a separate hut, but in many instances they share the accommodation with their owners.

Khataona.—Population 197 ; No. of houses 49 ; all of mud. This village is situated on the edge of a ravine with steep banks of compact conglomerate, and is in a fairly clean condition in its surroundings, though not so in its interior. Its inhabitants are Mussulman cultivators of the *Saral* caste, and compare unfavorably in

general appearance of comfort and prosperity with the occupants of the two villages already inspected. The water-supply of the village is from a well outside, which is shared in common with the adjoining village of Dhuma. It is situated low down near the ravine, is about 20 feet deep, and contains 12 feet of water which is considered of sweet and good quality. The village has suffered severely from epidemic sickness both amongst its human and brute inhabitants during the past 4 or 5 months. Four huts were untenanted owing to the death of their owners, and five or six others were occupied by widowed women and their children at the time of our inspection. The villagers call this disease "fever," but can give no intelligible description of its special character, more than that those attacked by it in some instances died after only 3 or 4 days of illness, and in others gradually sunk after lying in a semi-comatose state for 10 or 12, or more days. With respect to the epidemic amongst their cattle they described it as of two kinds; namely, one in which the animal suffered from cough with a running at the nose and swelling of the throat, and another in which it suffered high fever with a sudden and profuse diarrhœa. Both forms are considered equally fatal and unmanageable, and in fact, we were assured that in the height of the epidemic, 2 or 3 months ago, almost every animal attacked perished almost at once.

It may be here stated in anticipation of this day's inspection, that we heard much the same account at each of the several villages subsequently visited. One had lost 20, another 35, a third upwards of 60 head of cattle from this fatal disease during the past winter, and so on all through; the number only varying according to the size of the village. As with the cattle so with the people. The sickness and mortality was during the same period and in the same proportion amongst both.

In this village of Khataona we saw a cow suffering from the disease which had recently prevailed as a fatal epidemic. The animal was stalled inside the owner's hut, and was led out for our inspection into the court-yard in front of it, and was pronounced to be in the convalescent stage. She was a small animal, in very poor condition, with a rough; staring and mangy coat which clung to the ribs and pinched the belly. The muzzle was unnaturally moist, and there were signs of diarrhœa. The throat was said to be clear of disease. The owner looked as ill as his beast. He was a tall, emaciated man, with deep sunk, weary looking eyes, and an unwholesome yellowish green complexion—a hue which tinged the skin of his arms and chest also. He had been ill himself, but now considered he was convalescent.

On entering the hut which he and his family shared with their cattle we found a single chamber about 30 feet long by 12 feet wide, and 8 feet high. This room constituted the whole house, and had a single doorway in the middle of one long side, in front of which was a partially enclosed courtyard. The interior on one side of the doorway was occupied by a manger trough of mud built against one wall, and a row of 4 or 5 tethering stakes, whilst close along side the opposite wall were two upright corn bins of wattle and dab neatly daubed with mud plaster, and decorated with some simple and rough linear designs. Between the manger and the corn bins was the space allotted to the four cows we found standing in the courtyard, the sick one included, and its floor was one mass of mire, here and there collected into little puddles of putrid urine.

The interior on the other side of the doorway was occupied by the members of the family and their household goods. The floor was clean swept and neatly daubed with smooth mud plaster. Along one wall were resting two light bedsteads turned on their sides to give more moving space during the day, and on the opposite side were a row of earthenware jars, a spinning wheel, and some other domestic utensils; whilst along the side wall connecting the other two was a large corn bin so placed as to shut off a private corner. The central portion of this floor was occupied by a saucer shaped depression, which was the fire place. In the face of each side wall were several little arched recesses, very neatly plastered and simply decorated. In one was a hen sitting on her eggs, and others contained earthenware vessels, and a variety of other domestic articles. Altogether the place appeared very neat and tidy, and was doubtless the cherished home of those we found occupying it.

On shutting the door, as is done by the inmates when they retire with their cattle for the night, we found ourselves in entire darkness, and could find no single opening by which air could gain entrance or pass out, and presently the strong ammoniacal odour which attracted our attention on first entering became insupportably disagreeable, irritating the eyes and producing a sensation of nausea from which it was a delightful relief to escape into the open air. What the Committee saw in this village, as above described, was seen with but very slight, if any material, alteration in each of the several other villages visited in this day's tour of inspection, and the facts thus elicited give rise to some important reflections in connection with the late fatal outbreaks of disease amongst the horses of the Cavalry and Artillery stationed in the adjoining cantonment. Without advancing any dogmatic opinion upon the subject, the Committee would beg to draw attention to the bearing of the simple facts they witnessed in this village of Khataona, as above described, as well as in almost all the others inspected in this day's tour, and to point out some of the evils which it appears to them may be fairly attributed to the very faulty system of domestic hygiene disclosed in the description before alluded to.

Here we have the fact of human beings herding under the same roof and in the same room with their cattle during the cold weather as the ordinary rule of their lives. We find this common space entirely unprovided with any means whatever of ventilation, and its atmosphere in consequence altogether insupportable to those not inured by habitude, owing to its impregnation with exhalations from a floor saturated with decomposing urine and other excreta which are never removed though added to day by day during the five or six months that the cattle are housed with their owners. We learn that the appearance of any unusual sickness amongst the cattle or the villagers leads to no change in the usual routine of their daily lives, and that, as in the case now under consideration, the sick, whether men or cattle, or both together, continue to share their fate with impartial indifference. And finally we discover that the grain held by these villagers, till disposed of in the market, is stored in many instances in corn bins which are in actual contact with the bodies of their cattle whether these be sick or sound, whilst, as will be seen further on, we have come across men lying sick of the same disease as their kindred and cattle had died from, and in one case found a man and his beast ill of the same disease at the same time and in the same room. Enquiries made on the spot and from the people themselves show that the causes of this fatal outbreak of disease amongst both men and cattle are not attributable to want of food alone

for though prices have ranged high, and green fodder has been scarce, we found the peasantry well off in the matter of food, and saw stacks of chopped straw (bhúsa) about most of the villages, whilst almost every house had its store of maize straw. Whatever may be found to be the true cause of the recent sickness and mortality from which the villages of this district have suffered, it appears to this Committee that the conditions of life above illustrated cannot fail to exercise a very powerful influence in the development, aggravation and spread of any infectious disease the germs of which have once started into activity within the sphere of their operation.

Dhama.—Population 292, number of houses 72; all of mud. This village consists of four distinct clusters of huts separated by fields of corn cultivation. The inhabitants are Sayads with a few Ghakhar families amongst them, and are engaged wholly in cultivation of the soil. Their water-supply is from the single well which they share in common with Khataona, and from pools in the bed of the ravine which winds through their lands. The site of the main village is on sloping ground, which drops in terraces to the channel of the ravine about 200 yards distant, and is naturally well drained. Taken altogether, the state of this village is dirty and untidy. The lanes and courts are strewed with cattle litter, and the dung heaps are collected much too close about the walls. In most of the huts the people herd at night with their cattle.

Sayadan.—This is a small cluster of 4 or 5 homesteads belonging to the village of Mori Ghazan, and, apart from the injurious custom of stalling the cattle under the same roof with the owners, is in a clean, tidy and prosperous condition.

Toolsa.—Population 248. No. of houses 59; all of mud and stone or mud alone. The inhabitants are Mussulmans of the Bhatti and Varech castes, and are employed in agriculture. The water-supply is from two wells, one of which is in the bed of the adjoining ravine. In the latter the water is only a couple of feet below the mouth, whilst in the other it is about 22 feet from the surface. The water in both is about 6 feet deep, and is of good quality in the estimation of the villagers. There is besides a single cattle pond at some distance off. The village stands close on the edge of a deep ravine, and is sheltered under the lee of a ridge of hard conglomerate and sand stone rock. Its condition is fairly clean and tidy, but the dung heaps are too close round about the village.

Jarai.—Population 176; No. of houses 48. This village includes Dhak Jarai, a small hamlet of 8 or 10 huts clustered together at a distance of 4 or 5 hundred yards. The inhabitants are Mussulman agriculturists of the Sarál caste, and appear to be a prosperous community despite their recent losses by sickness. The only well belonging to the village fell in a couple of years ago, and has not been restored. Since the occurrence of this accident the people get their water from pools in the bed of the ravine about 500 yards distant. The site of the village is on open and elevated ground which drains in different directions into the ravine winding round about it. We found the village in a generally clean and tidy condition. Four of its houses were standing empty owing to the death of their owners during the recent sickness. The village suffered severely during the three months of December, January and February, having lost 30 head of cattle, and nearly an equal number of its human population. The mortality amongst the former was from the epidemic cattle plague, which was at that time rife here, whilst that amongst the latter is put down to "fever." Small-pox was also epidemic during the winter, and there are isolated cases of this disease in many of the villages around at the present time, but the outbreak appears to have been of a mild character, and not many deaths occurred from it. In one hut we saw a man ill of the "fever," which had proved so fatal during the recent cold weather. The man had been ill for about three weeks, and for the last 8 or 10 days had been lying on his bed in a lethargic and semi-comatose state, apparently sinking away gradually into death. The body was emaciated and the skin quite cool with a rough feel and dry to the touch. The lips, tongue and teeth were dry, and with this absence of moisture there was no collection of sordes. The complexion was of a dusky yellowish hue, and the eyes, which were sunk deep in the sockets were heavy and dull with a darkish, not red, injection of the conjunctiva, or white portion of the ball. The pulse was slow and full, and the voice low and "woodeny." The intellect was obscured, and questions were answered slowly, or carelessly, or not at all. Percussion on the front of the chest gave slightly hollow sounds and at the back decidedly solid ones. The abdomen was pinched and tucked in, and there was no diarrhœa. The case appears to be one of asthenic pleuro-pneumonia. At the further end of the room in which this man lay, were a manger and stall for three cows, and at the side of his bed and within a few inches of contact with it stood a large corn bin. The door of the hut was kept open during the day and closed during the night. There was no provision whatever for any sort of ventilation, and the atmosphere of the chamber at the time of our inspection though free from any very distinct stench was of a peculiar, heavy, still, and unrefreshing kind from which it was a relief to escape into the open air.

Kalial.—Population 247. No. of houses 77, built of mud and of generally neat and comfortable appearnce. This village stands on a high, open and airy site close to the edge of one of the numerous ravines intersecting this tract of country. Its alleys and courtyards are generally in a clean and tidy condition, the cattle litter &c. being removed to dung heaps at short distances in the fields around. The inhabitants are Mussalman cultivators of the Bhatti and Badan castes, and appear to be comfortably off, though in common with the last and other villages around they suffered severely from the sickness which prevailed during the winter months. They estimate their loss in cattle at about 50 head, and reckon the deaths amongst their community at something under half that number, the victims being mostly infants and aged people. Their figures are only approximate, as they have no idea of exact calculation. In many instances, here as in the other villages, the villagers share the shelter of a single roof with their cattle. But whether the cattle be stalled separately or with their owners, there is in either case no provision whatever for ventilation. The watersupply of this village is from a single well, which is 36 feet deep, and contains 5 or 6 feet of clear, sweet water. In the hot weather this well runs dry, and water is then got from springs in the bed of the ravine close by.

Jhawara.—Population 78. No. of houses 24. This is a small cluster of huts situated on the edge of a ravine and close to the district road to Talagang. It is occupied by Mussalman cultivators of the Dulál caste, and is in a generally clean and tidy state in its outward appearance. Its fields are cultivated quite up to the walls of the huts. It has a single well about 24 feet deep and containing 3 feet of water.

Ayal.—Population 186. No. of houses 46; mostly of mud with a few of stone. This is a considerable village of remarkably clean and prosperous appearance. It stands on an open, airy and elevated site in the midst of a wide sheet of cultivation. Its water-supply is from two wells, which are each about 30 feet deep, and contain 3 feet of water. In summer they run dry, and then water is got from a well in the bed of a ravine at some

distance away. The inhabitants are Mussalman cultivators of the Ayál and Ningyál castes, and appear to be a prosperous community, though by no means a robust or very healthy looking people. They suffered in common with their cattle during the winter epidemic sickness, and much in the same proportion as the surrounding villages. In most of the houses the cattle are housed apart from their owners, but in several they share together the shelter of a single roof.

Malpur.—Population 64. No. of houses 14. This is a neat and clean looking little cluster of houses situated on an open and elevated site draining into the ravine round about. It is surrounded by corn fields quite up to the walls of its huts, and is encircled by a series of dung heaps which are much too close to the walls. The inhabitants are Mussalman cultivators of the Khokhur caste, and live in the same way as their neighbours.

Mora Chappar.—Population 345. No. of houses 83, mostly of mud, but several of stone masonry. This is a considerable village, situated on a high and open site, near a big ravine, and occupied by Mussalman cultivators of the Dhamyál, Khumhál and Birya castes together with some 18 or 20 families of village artizans.

Its water-supply is from a single well and from pools in the bed of the ravines. The well is about 18 feet deep, and contains 9 feet of clear, sweet water. In its alleys and courts the village is in a generally clean and neat state. The interiors of the huts present a strange mixture of tidiness, order, and simple decoration in the parts occupied by the family, and of neglect and filth and evil odours in the part occupied by their cattle. In most of the huts there is a total absence of ventilation, but in a few exceptional instances there were found small air holes in the roof.

Lakhan.—Population 335. No. of houses 70. This village consists of four distinct clusters of huts separated from one another by sheets of cultivation. The houses are built of mud, and present a generally neat and regular appearance, their courtyards and passages also being in a remarkably clean and orderly condition. The inhabitants are Mussalman Rájputs of the Jattal and Jamiya castes, together with a few Gujar families. The site is open, airy and elevated, and cultivated quite up to the houses. The village has a cattle pond and a single well in common between its several divisions, and draws water also from pools in the bed of a ravine not far off.

Dhamyal.—Population 763. No. of houses 313. This is a good sized village with several substantial stone built houses. Its inhabitants are Rájput Mussalmans of the Jamiya caste, together with some 30 families of Hindu traders and 12 or 14 of village artizans. Its site lies somewhat low in a sheltered hollow, but it is well drained into a neighbouring ravine. The village has two wells, which are each about 60 feet deep, and contain 18 to 20 feet of water. We found it in a very dirty and untidy state, and in striking contrast with the general neatness and cleanliness of the lesser villages around. The courtyards were everywhere unswept and strewed with cattle litter, ashes and other refuse, whilst the alleys were encumbered with rubbish of sorts, and here and there partially obstructed by dung heaps piled up in corners or against the sides of the street walls. The outskirts were in a like neglected state of scavenging; the skeletons and bleached bones of cattle were found scattered about amongst dung heaps close outside the village, and especially about the several approaches from the outside.

Mori Ghazan.—Population 259. No. of houses 96. This is a neat little village in two divisions separated by a few fields, and like some other villages around comprises five or six detached homesteads scattered about in the surrounding cultivation. The site lies somewhat low, but is still open and freely ventilated, and efficiently drained into an adjoining ravine. The inhabitants are Mussalman cultivators of the Gangal and Pakhrál castes. The water-supply is from a single well and from pools in the neighbouring ravine. The well is 30 feet deep, and contains 12 feet of clear, sweet water.

Chabri.—Population 165. No. of houses 58. This is a neat and compact little village at the side of the district road leading to Talagang and near a winding ravine into which its lands drain. The site is open, and cultivated up to the village walls. The water-supply is from pools and springs in the adjoining ravine.

Kotha.—Population 202. No. of houses 32. This is a neat little village situated on an open site which is freely drained into an adjoining ravine from which it draws its water-supply. It has no well. Its inhabitants are Mussalman cultivators of mixed castes, including 4 families of Sayads. It is generally in a clean and tidy condition, and wears a look of prosperity.

The several villages visited by the Committee in this day's tour of inspection are comprised in the south-western quadrant of the five-mile radius circle as will be seen by reference to the map attached to this report which has been traced from the one prepared in the Quaster-master General's Department.

The tract of country included in this area presents a very uneven surface which stretches in wide undulating sweeps towards interrupted ridges of sandstone and conglomerate in the east, towards a broad crest of alluvial clay in the west, and towards a jagged and broken range of rocks which project against the horizon in the south. Its surface soil is a stiff red clay where uncultivated, and a light marl where under crops, with here and there outcrops of sandstone rock, and banks of conglomerate. This sandstone is quarried for the supply of building stone to the cantonments, and the clay is made into bricks for the like purpose. The whole area is traversed in all directions by numerous winding water-worn gullies which converge from east and west and north towards a main ravine which takes a south-easterly course to join the Sohan river. This main channel contains a perennial supply of water, which in the dry season is in the form of a succession of isolated pools along the course of its bed; whilst several of its larger tributaries contain springs of water in sheltered hollows at the base of their conglomerate banks. The high ground between these drainage gullies and water-courses furnishes the sites for the several village settlements and their cultivation, as well as more or less extensive patches of pasture ground. Such in brief are the main outlines of the area traversed in this day's tour of inspection. The country is open though depressed relatively to the high ground of the cantonment site, is freely wind swept, and unusually well drained. It is almost entirely bare of trees, excepting those grown in and about the villages, and supports but a very scanty natural vegetation of any kind. Where cultivated, the soil produces good crops, but they depend entirely on the rains for their success. The villages taken as a whole are neatly built, and the huts generally in the arrangements of their interiors present evidence of care and expense in their furniture and decoration. In short the locality generally, the sites of the villages severally, and the plan of the huts individually, possess, to a degree seldom met with on the plains of this Province, all the elements of a salubrious and comfortable residence; but all these advantages are unfortunately lost by the absence of one essential, namely the provision for house

ventilation--a provision which is the more absolutely necessary here owing to the custom of the peasantry sharing in a common chamber, the shelter of a single roof with their cattle, and other domestic animals during the cold weather—a period which may be reckoned as extending over five or six months of the year. As the result of their experience of the peasantry seen in the several villages visited this day, it appears to the Committee that the standard of their physical developmentand appearance of health generally is below what might have been expected under the conditions of their wealth, and compares unfavorably with the standard of those qualities as observed amongst people of the same social class and mode of life in some other parts of the Province, both to the east and to the west of this position ; and it seems to them that the faulty construction of their dwellings and the pernicious custom of herding with their cattle, as described in the preceding portion of this report, cannot fail to exercise a powerful influence in the production of this inferior standard of physical development, apart altogether from the other serious evils that they are calculated to give rise to on the invasion of any infectious or epidemic disease.

18*th March* 1879.—The Committee assembled at 8 A. M. and proceeded at once to inspect the villages in the south-east quadrant of the five-mile radius circle. The result of the inspection is recorded in the following report of the several villages in the order that they were inspected.

Kotha Kalan.—Population 885. No. of houses 215. This is a large village comprising four distinct divisions separated by corn fields, and including six or eight detached homesteads dotted about over the cultivated area around. The village is situated on an open and elevated site, which is drained by several ravines into the channel of the Sohan river. The inhabitants are Mussalman cultivators of the Sansrál caste, together with several families of village artizans. There are no wells here, the water-supply being drawn from springs in the ravines leading to the Sohan or from that river itself which is distant about half a mile. The village was found to be in a generally clean and tidy condition with well swept courts and alleys. The cattle litter and sweepings are piled in dung heaps at convenient distances in the fields around. In a few instances we found the cattle housed under a separate roof from that of their owners, but in most instances they are accommodated under the same roof with the family. In the smaller huts they share one and the same apartment with the family, but in the larger ones they have a separate room either at one side or in rear, and in either case communicating with the dwelling apartment of the family by an open doorway. This doorway is the only opening in these cattle dens, and the only access to them is through the house door and across the dwelling room of the family. The state of these cattle dens was in many instances horribly filthy and slushy with mire of putrid urine and cattle dung, and the pungent ammoniacal stench in them positively unendurable. We found that from 10 to 15 head of cattle (cows and buffaloes) were commonly confined night after night throughout the past winter and up to the present time in these dens, which are usually about 20 feet long by 10 feet wide and 8 feet high. On closing the front and only door of the hut against the bright sunlight out-side the whole interior was obscured in a pitchy darkness, and in most instances there was no single avenue for the access of air other than the chinks between the door and its frame. Only a few brief minutes of confinement in this shut up atmosphere overtaxed our powers of endurance, and the escape into the open air was delightfully refreshing It is in fact surprising, that the cattle subjected to this sort of life can survive its hardships, though in truth it is abundantly clear how seriously they suffer from its evil effects. Instead of being well fleshed, lively and with the glossy coat of health, they are scraggy, weak, and torpid with rough, staring coats or mangy hides, and with all the appearances of an ill-favored and degenerate breed.

This village suffered severely during the late epidemic sickness, both in men and cattle. Upwards of one hundred of its inhabitants are reckoned to have perished during the past sickly season from what the natives term "fever and pleurisy," (*bukhár aur hūk*), whilst the loss of cattle is stated at nearly two hundred (including cows and buffaloes together) from the same disease,

Morgha.—Population 525. No. of houses 151. This village is built upon a surface of hard conglomerate, close upon the edge of a deep ravine with scarped banks, and below a plantation of trees which shade the tomb of some local saint of former times. The situation lies low, and is sheltered towards the west by a bank of conglomerate from which the country slopes eastward to the cliffs forming the right bank of the channel of the river Sohan. Its houses are built of boulders and pebbles set in mud plaster, and its courts and alleys present a hard and uneven surface of compact conglomerate, the depressions in which give lodgment to miry puddles mixed with the drift and refuse of cattle litter. The fields around are newly ploughed, and thickly strewed with small boulders and pebbles, and dotted about with large dung heaps which will form much of its crop soil. The water-supply is from some springs deep down in the bed of the ravine immediately to the south of the village. We found three dung heaps collected on the edge of this ravine, and directly above the pool of the spring, some 130 feet or so below, and gave instructions for their immediate removal. The villagers are a prosperous and thriving community of the Gujar caste, and generally presented a superior physique to that of the villagers seen in the previous course of this inspection. The houses are generally very neatly built, and show evidences of care and expense in their internal furniture and decorations which are in strange contrast with the filth of their exteriors and of the cattle sheds connected with them.

This village has suffered severely during the epidemic sickness of the past winter. The number of cattle lost by death is stated as over two hundred since November last, and about 50 persons of both sexes and all ages (including several of middle age) are said to have died of fever and pleurisy since December last. No connection is suspected between the diseases that have thus contemporaneously killed the cattle and their owners. In one house we were asked to see a man who was lying ill of fever, and had been in a semi-comatose state for the last six or seven days. He was a middle aged man, and his state and surroundings were precisely those of the case seen at Jarái as already described. In this village we inspected several of the houses in all their interior arrangements. In some of them the cattle are housed under a separate though continuous roof with the family, that is to say, the cattle shed is entirely shut off from the dwelling house and has a door of its own, but both the door of the cattle shed and that of the dwelling house open on to one and the same courtyard. In the majority of instances however the cattle are under the same roof as the family, either in a single apartment or else in a separate apartment opening into that occupied by the family through an open doorway. Barring a few exceptional instances none of the houses are provided with any means whatever of ventilation, not even with an outlet for the smoke of their evening fires. We here examined one of the separate cattle sheds. It stood at right angles to the family hut and occupied one side of the courtyards on to which it opened by a single doorway

in the centre of its front. The shed is about 24 feet long by 12 feet wide and 8 feet high, and the roof is propped up along its middle line by a few upright pillars of wood. The floor was very uneven and covered with a slush of dung and urine which was here and there collected into little puddles of filthy liquid. The interior was dark, and its corners invisible with the door wide open, and a very pungent ammoniacal smell was met at the entrance. On stepping inside and closing the door we were in total darkness, only thin beams of light being visible through the chinks between the door and its frame, whilst the atmosphere of the place was so highly charged with ammoniacal vapours as to be with difficulty supportable after a few minutes. This is no exaggerated statement. The facts are as described, and surpass belief. All these cattle sheds are perhaps not in so foul a state as this particular one, in which we were informed that from 12 to 18 head of cattle had been shut up nightly during the past six months ; but they all are, and must be under such conditions, if not directly injurious, at the least extremely uncomfortable.

As in other villages, so here particular pains were taken to point out the faults of these buildings, as well as of their own dwellings, to the villagers, and to explain to them the evil effects of living for a third portion of every 24 hours in an atmosphere continually polluted by the exhalations from their own persons and the bodies of their cattle without any means of the foul air being changed by the access of fresh air from without, whilst the neglect to purify the place thus fouled day after day greatly intensified the evil. It was explained to them how life depended on the act of respiration, and how the standard of bodily health and development was influenced by the quality of the air thus respired. Familiar and easily comprehended illustrations were used to show them how repeated and long continued exposure to an impure atmosphere operated to reduce the healthy standard of bodily growth and strength, not only by depriving those subjected to such conditions of the requisite supply of pure breathing air but by subjecting them to the influence of foreign gases and vapours which might, and as a fact often did so, prove very injurious or even poisonous. The people everywhere acknowledged the propriety of what we brought to their notice, admitted that the want of proper provision for ventilation in their houses was a serious evil, and expressed their intention of at once remedying the defect by carrying out our suggestions for the construction of air holes in the roof or in the walls opposite the entrance door. They said indeed that ventilators were an acknowledged necessity and were already provided in some of their huts, and they attributed the fact of their only partial adoption by the people to the ignorance prevailing amongst them on the subject of the evils resulting from the neglect to provide these means for the escape of foul air and its replacement by fresh. Now that these evils had been pointed out and explained so clearly to their understanding, they would lose no time in remedying the defect, and this for their own immediate advantage the nature of which was self-evident, both as regarded themselves and their cattle.

Their custom of sheltering their cattle during the winter months under the same roof or in the same apartmen as themselves was not a matter of choice but one of necessity owing to inability to provide separate accommodation. Those who could afford to do so always housed their cattle apart from themselves. The faults and evils we had drawn their attention to were the result not of wilful neglect but of ignorance. The people were habituated to the conditions we had seen, and were not much inconvenienced by them, nor did the evils we had pointed out as resulting from them ever attracted their attention or engaged their thoughts, but it was quite clear that they could materially improve the atmosphere of their dwellings by the simple means suggested, and they would readily do so for their own benefit. Such in short was the nature of our advice to the people on the subject of their home ventilation, and such was their ready acceptance of it. The willingness on their part to adopt the simple expedient of air holes is satisfactory and encouraging; on our part it will be worth while to see that these measures are really carried out.

Topi.—Population 186. No. of houses 46. This is a poor and dirty little village situated close to the high scarped bank of the Leh river where it winds round the east side of the elevated mounds covered by the Park preserve. Its inhabitants are Mussalmans of the Gujar and Dhamyál castes, and include some families of village artizans. It has a single well, which is about 22 feet deep, and contains 7 feet of clear, sweet water. At the time of our visit all the men were away at work in the fields, or, as was the case with most of them, on the railway cutting not very far off. The hut interiors are much of the same character as those before described, and generally speaking neatly and cleanly kept so far as is practicable with the cattle under the same roof with the family. The courts and passages were in a very dirty and neglected state, and the ground immediatly around the village was strewed with all manner of refuse and filth including dirty rags, ashes and bones. In one house we saw an old man lying ill of fever. He was unable to give any account of himself, and the women around were able to give us no further information than that he had been ill for 12 or 14 days but was now getting better. We here also saw a boy of 7 or 8 years of age covered with the drying scabs of small-pox, as he was carried about in the arms of a bigger boy. We had previously seen 4 or 5 cases in a like stage of convalescence in some of the villages inspected yesterday. This village lost about 20 head of cattle during the recent epidemic. The villagers supply milk to the cantonments.

Jhanda.—Population 496. No. of houses 120; mostly of mud. This village is situated close on the steep bank of the Leh river, and at a short distance from the Police lines and bazár. It is inhabited by Mussulmans of the Bhatti caste, many of whom are weavers, and village artizans. The hut interiors are tolerably clean and tidy, but they are mostly unventilated, and several of them shelter cattle. The courts and passages and immediate outskirts of the village are in a very dirty and neglected state, the surface everywhere being strewed with rubbish, litter, ashes, rags and bones. The village has a single well which is 60 feet deep and contains 12 feet of rwater which is sweet and clear. The principal supply of the village however is from the adjoining river. The village contains a large number of cattle, and supplies cantonments with milk. It lost between sixty and seventy head of cattle during the late epidemic, and nearly an equal number of its human population. Close to this village is the Police bazár. We found it in a very filthy condition, and apparently under no supervision whatever. The proximity of this village and bazár to the cantonments renders it advisable that their conservancy should be carefully attended to, and placed under some sort of supervision.

Marir.—Population 519. No. of houses 144, amongst which are several built of stone masonry. The nhabitants are Mussalmans of mixed castes and occupations, but the Khokher and Awán are the most numerous. The village is situated on the road leading from cantonments to Murree, and nearly opposite to the gas works. It is in a very dirty state, and apparently gets no scavenging at all. Close in rear of the village is the Leh river, and between the two passes the line of the projected Railway. There are about 400 head of cattle (milch cows and

buffaloes) in this village, which is one of the principal sources of the milk supply of cantonments. We found their sheds and yards in a very filthy and unkept state. The village suffered very severely in the late epidemic, and lost many men and cattle. Accounts are conflicting as to the numbers of each, but they were probably not less than 40 and 60 respectively. The sanitation of this village requires to be attended to. These two villages of Jhanda and Marir are by far the most dirty and untidy of all those yet seen in the course of this inspection.

19th March 1879. The Committee met at 8 A. M., and at once proceeded to inspect the villages in the north-west quadrant of the five mile radius circle, with the results here recorded under their several headings.

Rata.—Population 980. No. of houses 250, several built of stone, and generally of a neat appearance. It is situated on the steep bank of the Leh river, and of a ravine cutting into it. The inhabitants are Mussalmans of mixed castes, principally Awán, Khabbar, and Kashmiri, and live by working in the cantonment and supplying it with milk, vegetables, &c. The condition of the village is generally clean and tidy, and the houses visited were found to be kept in good order, though they are mostly unventilated. There are four wells in the village. Their average depth is about 50 feet, and they contain about 13 feet of water in each, clear and sweet. There is a grave yard beyond the ravine on the west side of the village. Three or four graves have been recently filled on a site somewhat beyond the grave yard area, and on a ledge low down in a ravine on its further side. The site is only a couple of feet above the bed of the ravine, and is objectionable owing to its being in the line of the flood current and only some 40 or 50 yards from a well sunk on the edge of the ravine at a spot lower down its course. The burying of bodies in the hollow of the ravine should, we think, be prohibited by the local authorities. This village is within cantonment limits.

Chur.—Population 356. No. of houses 87. This is a small village situated at one side of the trunk road to Peshâwar. It is occupied by cultivators of the Awán caste, and was found in a very dirty and untidy state, both inside and round about outside. The courtyards were unswept and encumbered with small heaps of cattle litter and dung heaps were piled up against or close to the walls outside. There are several pits immediately about the village, and a wide hollow at its entrance. This last is drained across the trunk road under a small bridge, and was found in a very dirty state with the scatterings of two dung heaps on its surface, and some offensive puddles of mire. There are two wells here and three cattle ponds. One of the wells is about 90 feet deep, and contains 12 feet of water, whilst the other on lower ground is only 36 feet deep, and contains 4 feet of water. The water is sweet in both. One of the ponds contains water all the year round; the other two dry up in the hot weather. This village lost about 20 head of cattle during the late epidemic and several of its people from fever and small-pox. The latter disease is still in the village.

Siham.—Population 751. No. of houses 189, all of mud. This village stands a little way off to the south of the trunk road, and consists of three distinct divisions with 4 or 5 outlying homesteads. It has no wells of its own, but shares those belonging to the neighbouring village of Chur. It has two cattle ponds, one of which dries up in the hot weather. The inhabitants are Mussalman cultivators of the Sihám, Awán, and Gujar castes. The village is in a dirty and unswept condition with cattle litter strewed about the courts and alleys, and dung heaps piled against the walls or close about outside.

Bukra.—Population 310. No. of houses 65. This is a small village situated on an elevated site between two winding ravines of considerable depth, and at some distance away to the north of the trunk road. It is inhabited by Gujar and Kashmiri cultivators, and in no way differs in general characters from the villages before described. It has one well, 30 feet deep, but this has long been dry, and water is obtained from springs in the neighbouring ravines.

Sarain.—Population 332. No. of houses 63. This village consists of two distinct hamlets, inhabited by cultivators of the Gorhra caste. It has a poor and neglected appearance, and was found in a dirty and unwholesome condition. The bones and skeletons of cattle and a half devoured carcase strewed the ground close about outside, whilst dung heaps and litter encumbered the approaches and courtyards. The village lost about 45 head of cattle, and 26 of its people during the recent epidemic. It has one well, which is 72 feet deep and contains 6 feet of sweet water, but draws its principal supply from the springs and pools in the neighbouring ravine.

Davar.—Population 240. No. of houses 62. A neat and generally clean village on an open and elevated site close to the Leh river from which it draws its water.

Ghazni.—Population 18. This is a collection of 4 separate homesteads planted on a level site in the midst of corn fields.

Gulshah Dhok.—Population 56. No. of houses 10. Water from Leh river. Inhabitants Awán cultivators.

The general aspect of the country traversed in the course of this day's inspection is open with a wide sweep and gentle slope from the crest which crosses the trunk road from Siham to Bohra in the west towards the channel of the Leh river which winds eastwards close past the north of the city of Rawalpindi. Towards the north and beyond the range of our inspection, the country slopes gently up to the ridges and banks forming the skirt of the Murree range of hills. The surface soil of this area is a light friable clay, and is almost everywhere under cultivation which is dependent on the rains for its irrigation. Along the western margin of the area, and in the vicinity of Bohra, there is an outcrop of conglomerate and sandstone about which the soil is arid and hard. The whole area except about the villages, is treeless, and that portion of it to the north of the trunk road is cut up by some deep winding ravines which serve as feeders to the Leh river. In the bed of these ravines are numerous perennial springs and pools of sweet water.

The villages in this area are not nearly so neat and tidy in appearance as those seen in the two southern sections, though in the interior arrangements of their huts they are much of the same stamp, the families in most instances sharing a room in common with the cattle. In almost all these villages the sweeping of the courts and alleys, and the forming of dung heaps at a distance in the fields around is neglected, and consequently the approaches and interior passages are disfigured and rendered unwholesome by scattered litter and refuse of all sorts. There should be no difficulty in securing a better state of domestic scavenging if the village headmen take the matter in hand. We could find no reason to account for the difference in the style of domestic conservancy in these villages and those in the southern sections, except in the degree of attention given to the duty by the villagers.

20th March 1879. The Committee met at 8 A. M., and at once proceeded to inspect the villages in the north-east quadrant of the area defined, with the results noted under the head of each.

Dhok Desraj.—Population 58. No. of houses 15. This is a neat and flourishing little hamlet a few yards off on the side of the district road to Sayadpur. Its inhabitants are of mixed castes and creeds, comprising a few Mussalman families of Dhund and Kashmiri and Hindus of the Brahman caste. Most of the huts have separate accommodation for the cattle, and they are also provided with air holes. This village lost no cattle during the last epidemic though several were taken ill. They were in different houses, and recovered without further spread of the disease.

Dhinna.—Population 261. No. of houses 67. This village consists of two divisions separated by the river Leh, which flows between them. There are also 3 or 4 separate homesteads belonging to each division. One is occupied by cultivators of the Dulál caste, and the other by Sayad families. In general the village is in a remarkably neat and tidy condition, and several of the houses are ventilated by air holes in the roof or side walls. The village lost only 3 or 4 head of cattle during the late epidemic. Its cattle sheds are the cleanest of any yet seen, and have doors of reeds wattled together in place of wood boards.

Pandora.—Population 230. No. of houses 48. Situated close to the Sayadpur road. In clean condition. Inhabitants of the Dhund caste. Has one well, which is 60 feet deep, and contains 14 feet of water, clear and sweet. Houses generally well kept, and many of them ventilated. Cultivation is quite up to the walls. This village lost only 4 head of cattle during the recent epidemic, *viz.*, three cows and one buffaloe.

Narala.—Population 445. No. of houses 89. Consists of two distinct villages separated by a patch of cultivation. One is on an eminence, the other on the plain. The latter is Narala Khurd, and contains about 45 houses, occupied by cultivators of the Teli and Tarkhan castes. The former is Narala Kalán, occupied by Dhund cultivators. Both divisions are untidy and unswept. In many of the huts the cattle are housed with the family. The village has one well which is about 75 feet deep, and contains 12 feet of sweet water.

In Narala Kalán we saw a cow suffering from the disease which has proved so fatal as an epidemic during the past winter, and also her owner who was slowly recovering from an attack of fever and pluerisy *(bukhár aur hāk)* which had confined him to his bed for the past six or seven weeks. Both were side by side in the court in front of the door of their hut. The one was crouched on the ground, and the other was seated wrapped up in a counterpane on his cot. Each, in his own way, looked very sickly. The man had a wan and weary look with an unhealthy dusky yellow complexion, but was not so emaciated as some others we had seen suffering from the same disease. His pulse was slow and full and weak, that is, easily compressed, and the skin was dry, cool, and harsh to the touch. He was perfectly sensible and even bright in conversation, and declared himself all right again, only too weak to move about. His brute was emaciated to such a degree that the hip bones and ribs were prominently traceable under the skin, the coat of which was rough, dry and staring, with here and there mangy patches from which the hair had fallen off. The eyes were half closed, and the head sunk almost to touch the ground, and the respiration was so slow as to produce barely perceptible upheaval of the ribs. The snout was preternaturally moist, and from each nostril depended two or three ropy cords of thick purulo-sanguineous mucus. There were some signs of diarrhœa, and altogether the beast appeared to be in a semi-comatose state. The animal had been ill for 6 or 7 days, and as the cough was slight and the other symptoms mild, it was hoped she would recover. On entering the hut we found it to consist of a single chamber about 24 feet long by 12 feet wide, and 8 feet high. The interior was much restricted in space by two large corn bins on one side of the doorway, and three lesser ones on the other side. In the former half was a low manger along the base of the wall, and a row of stakes for tethering four oxen, but there were only two to share this accommodation with the sick one we had seen outside. The other half of the chamber was neatly arranged with the household goods and furniture of the family, which comprised four members including the master whom we found in the courtyard; and its floor was carefully swept and scrupulously clean to look at. The cattle stall was also well swept, but its floor was damp to saturation with the urine of its tenants. On closing the door the entire interior was obscured in darkness, so as to render the nearest objects invisible. The atmosphere was not ammoniacal, as was observed to be the case in most of the other huts in which we tried the same experience, but it was charged with a peculiar faint and sickly odour which clung to the nostrils for sometime after coming out into the open air. In this hut there was no provision whatever for ventilation, but in some others we discovered that there were air holes in the roof which had been stopped up with clods and plaster at the commencement of the winter to keep out the cold night air which is popularly believed is peculiarly fatal to cattle exposed to its action.

Sohan.—Population 704. No. of houses 210. This is a considerable village upon two adjoining eminences of clay, one of which presents a scarped bank down to the bed of the river which flows immediately at its base. The village is continuous across the dip between the two eminences, and comprises also several isolated homesteads and 3 or 4 little hamlets dotted about on the uneven ground around. Its inhabitants are cultivators of the Awán caste, and include many families of village artizans of different crafts, together with several Kashmiri weavers and outcastes of the sweeper class. It is a poor village, and very dirty and untidy in its interior and surroundings. It suffered severely during the late epidemic sickness losing upwards of 80 head of cattle and nearly 50 of its population. We found small-pox rife in the village at the time of our inspection.

Khannah Kak.—Population 125. No. of houses 42. This is a poor and very dirty little village inhabited by Mussalman Rajputs of the Janjua caste. It stands on the crest of a slope which stretches down to the bed of the Kuranj rivulet, the stream of which winds through a wide shingly bed to join the Sohan river. The huts are very poor and dirty residences, and much inferior in comfort to those heretofore seen. The village suffered very severely during the late epidemic, losing 2 or 3 head of cattle in each house, and nearly as many, we are assured, of its population.

Shakrail.—Population 320. No. of houses 81. This also is a very poor and dirty village situated upon broken ground, which slopes to the bed of the Kurang rivulet, and over looks a wide marshy reach in its course. The inhabitants are cultivators of the Jajyál and Fihál castes with some Sayad families. In most of the houses the cattle are accommodated with the family. None of the huts are ventilated, and in two we found that previously existing air holes had been carefully closed up at the commencement of winter. The village lost 2 or 3 head of cattle in almost every house during the late epidemic, and a large number of its population, mostly infants and aged people.

Khannah Dak.—Population 986. No. of houses 210. This is a considerable village situated in two divisions on each side of the district road to Karor where it drops to the bed of the Kurang rivulet. It is occupied by Malyar and Arayin cultivators together with village artizans and some Hindu families of the Brahmin caste. It is a clean, tidy and prosperous village, and its inhabitants present a better physique than those of any other village in the northern sections of the area under inspection. The interiors of its houses are in most cases remarkably clean and neat, but they are entirely unventilated. The cattle are in many housed separately. The village is said to have suffered very severely in the late epidemic, almost every house having lost 2 or 3 head of cattle, and few houses having escaped a death amongst the members of its family.

Gangal.—Population 823. No. of houses 227. This village consists of three main divisions and several detached homesteads spread up and down over an elevated ridge near the bank of the Kurang rivulet. It has a very neat and clean appearance, and is occupied by Malyar cultivators. Few of its houses are ventilated, but in most the cattle are stalled separately. It suffered very slight loss from cattle disease, and has lost only 12 or 13 of the community, mostly from "fever and pleurisy."

Chak.—Population 291. No. of houses 77. A neat and prosperous looking little village on a level site a short way off the district road to Karor, and about two miles from cantonments. In general character it resembles the villages already described, and supplies milk to cantonments. The interiors were not inspected, but the surroundings were found generally in a clean state. This is the last of the villages visited by the Committee. The remainder of the area included within the five-mile radius is occupied by the Military cantonments and the Municipal town of Rawalpindi, each of which has its own organized system of conservancy under the direct supervision and control of the Military and Civil authorities respectively.

The Committee carried out the duty before them on horseback, being repeatedly in and out of the saddle during six or seven consecutive hours on each of the successive days of inspection. They thus gained an insight into the actual state of the villages and conditions of peasant life, which it appears to them, notwithstanding the very serious evil of the people commonly living with their cattle in unventilated chambers, are on the whole much better and more comfortable than they expected to find. They are of opinion that the general sanitary state of the villages and the conditions of life of their inhabitants can compare favourably with the corresponding circumstances amongst the people of the same social grade who are crowded together in important and much frequented parts of the native quarters in the Military cantonment and adjoining native town, as will be mentioned more particularly further on.

Following the course adopted by the Committee which, in the course of an enquiry similar to the present, last year reported the result of the inspection of the villages around the Meean Meer cantonments, this Committee before submitting the measures they recommend for the improvement of the villages now inspected, as well as of all others situated within the area defined by Government for this investigation, proceed to review briefly the main features in a physical and hygienic sense of the area covered by them, with the object of discovering how far, if at all, these features affect or are affected by the actually existing conditions of the villages themselves, and of ascertaining whether these circumstances and conditions really exercise any injurious action in respect to the salubrity of cantonments, and if so, its nature and manner of operation. The subject is considered under the separate heads of topograghy, cultivation, and sanitation.

Topography.—The area included within the five-mile radius circle of the Rawalpindi cantonments is situated at the base of the outer ranges of the Murree series of hills, and presents in its general aspect an open undulating plain with wide sweeps that rise into crests or ridges, which lie across a line from east to west. There are three such crests or broad ridges within this area, namely, one at its western periphery, which cuts the horizon in that direction; another of greater height and more irregular form which ranges along the eastern periphery and slopes to or abuts in steep cliffs upon the bed of the Sohan river; and a third which has a centrical situation, and towards the east is continuous with the high ridge in that direction. This central crest or ridge is occupied by the site of the Military cantonment. From it the country slopes away to the north and south in wide and open sweeps. In the former direction it sinks to the channel of the Leh river beyond which it rises very gently to the foot of the hills; and in the latter it drops to the course of a wide and tortuous ravine, which runs south-eastward into the channel of the Sohan river, and again rises towards a jagged and broken line of rocks which rise against the sky to the southward.

On the northern side in the depression between the high ground of the cantonment (occupied by the fort and European barracks) and the Leh river are situated the Native Cavalry lines and European bungalows, the Sadr bazár and the Commissariat and other lines, whilst across the river and close upon its bank stands the native town of Rawalpindi. In this hollow on each side of the Leh river are massed the bulk of the population of the whole area, and the locality itself possesses special characters distinguishing it from other parts of the defined space within which our inquiries are confined. That is to say it is more thickly populated, worse ventilated, and better stocked with trees than the country outside, and it contains spots vastly more filthy, and in every sense more unwholesome and uncomfortable than any we saw in the villages around, as will be noticed further on.

The area as a whole is freely ventilated, and is thoroughly drained by an intricate ramification of ravines and gullies which pertain to three distinct channels of outflow. The ravines which cut up the surface in the tract bordering on the north-eastern periphery of the circle conduct into the Kuran rivulet which is an affluent of the Sohan river.

The Leh river by a wide fan of ravine cuts, gathers the drainage from the northern and western tracts, and flowing south-eastward in a tortuous course through the central portion of the area joins the Sohan near its passage by the trunk road to Lahore. Whilst the southern and south-western tracts are traversed by a number of winding gullies and water-courses which converge to a main ravine whose course is south-east to join the Sohan. The streams in these three main channels are perennial, and there are also numerous constant springs in the beds of their feeder ravines. These serve to supplement the supply of water derived from wells, of which most of the villages have at least one. The depth of the wells generally varies with the elevation of the village site, the water stratum in all being about the same level as the ravine beds. The water is everywhere clear, and is generally esteemed of good quality by the people.

The main roads of communication across this area are the following:—

The Lahore and Pesháwar trunk road which cuts it diametrically from east to west. The Murree road which crosses the northern half and the Talagang road which crosses the southern half. There are besides, two district roads to Sayadpur and Karor on the west and east respectively of the Murree road. All these concentrate in the cantonment. Inter-communication between village and village is by mere foot paths. The surface soil, where under cultivation, is a light friable marl. Below the surface it becomes more compact and solid, and assumes a reddish color, which is more clearly seen in the indurated clay banks of the ravines. The southern and eastern tracts present extensive and prominent outcrops of sandstone and conglomerate the pebbles of which are consolidated by a strong silicious cement. The sandstone and the clay in the southern tracts are quarried and worked into bricks respectively for use in the cantonment. In all the tract, with the exception of two or three reaches in the bed of the Kurang and Leh towards their terminal course, there are no marshes nor other collections of such water, though there are a few pools in different parts of the eastern tracts. But these are in genuine hollows, and the soil around is not water-logged.

The area taken as a whole is bare of trees, except about the several centres of habitation, or where planted along the road sides. Almost all the villages have a few trees of kikar or bakáin planted in and about them, but the open country is bare of them. In and about the town and cantonments, there is an abundant growth of large trees in great variety, both timber and fruit, and the ridge to the east is covered with a preserved jungle called the Park.

Cultivation.—Outside the cantonment and municipal limits the cultivation is entirely dependent on the rains for irrigation. Owing to its character, as mentioned, and very free drainage, the soil is naturally poor and dry, and much cut up by water worn gullies and ravines. This intersection by ravines greatly diminishes the surface for cultivation, and gives the portions thus separated a relative elevation which secures them a quick drainage and free ventilation. They are the sites on which the villages are situated, and every available patch of ground around is brought under cultivation and plentifully manured. The crops raised are wheat and barley and maize with mustard, cotton and gram. In ordinary seasons the land yields abundantly for the wants of the people and their cattle. We found as yet untouched straw (*bhusa*) stacks about all the villages visited in the course of our inspection, and were informed that although there was a decided scarcity of green pasture last autumn, the cattle were not distressed for want of food.

Sanitation.—The actual sanitary condition of the villages inspected has been briefly recorded under the head of each separately. On the whole it appears to the Committee that, even with the serious defects mentioned in the case of individual houses the general sanitary condition of these villages is not such as to call for the intervention of Government on the grounds of their being a constant source of danger to the health of the community located in cantonments. As a matter of fact, the sanitary condition of these villages, with two or three exceptions which we shall presently notice separately, is in almost every respect superior to that which is found to exist in some parts of the cantonment and of the neighbouring municipal town. The defects of ventilation and the faults of herding with cattle as discovered to exist in the villages have been described in the body of this report, but it appears to the Committee that serious as these evils are in themselves, and injurious as they have proved to the villagers exposed to their operation, they are not so great evils nor more injurious in their operation as disease factors than the state of affairs which combine to constitute the sanitary condition of some crowded and very much frequented portions both of the Military cantonment and of the municipal town of Rawalpindi. At the same time, however, they are not to be considered as trifling defects. In the opinion of the Committee the facts discovered concerning the co-existence of pleuro-pneumonia in man and beast under one and the same roof raise grave suspicions respecting its connection with the contemporanious prevalence of this disease in our jails, and police and military hospitals, and it appears to them that the subject is one worthy of special and extended enquiry, an enquiry to range over wide tracts not only of this and neighbouring Provinces but to include the other portions of the Indian Peninsula. It is beyond the scope or even the powers of this Committee to approach the subject of the pathology of this disease or to discuss the question of its communicability or otherwise, but it appears to them that the bare facts briefly recorded in the body of this report furnish sufficient grounds for believing that cause and effect are here seen together, though they are unable to follow up the enquiry with the exactitude and research which the importance of the subject demands. Apart from this very serious evil of human beings living with their cattle in confined and unventilated rooms, the villages in the area under consideration are on the whole in a satisfactory sanitary condition, and apart from the prime requisite of separate accommodation for the cattle they only require the introduction of an efficient means of ventilation to render them very comfortable and wholesome abodes, and at all events more salubrious residences than the crowded slums of the native city or the native quarters of the cantonment Sadr bazár.

We found nothing in any of the many villages inspected to approach in filthiness, offensiveness and unwholesomeness, the state of the side streets in the cantonment Sadr bazár, whilst the state of the public thoroughfares in even the most untidy villages will compare favourably with the condition of the main street of that same bazár. In no village of those we inspected was to be found anything like the filthy state of Davis street with its sewage saturated alleys, its unswept passages, its foul drains, and its atmosphere of villainous stink, nor anything so unwholesome as the crowded slums and untidy tenements about this quarter of the Sadr bazár.

No village which we visited was in anything like the dirty and neglected state of the Maharáj Sarái in the municipal Sadr bazár. Nor was any village hut we entered so little fit for human habitation as are the dwelling rooms of this same Sarái. In fact it may be fairly said that the villagers have more to dread from communication and dealings with these parts of the cantonment and municipality than either the one or the other has to fear from connection with them or their country homes. Bad as is the state of the cattle sheds in most of villages, and faulty as is the nature of their house ventilation, these evils are by no means peculiar to them, nor are they so disagreeable to the senses or so injurious to the health as are the defective sewerage and neglected scavenging of the Sadr bazár slums and the Maharáj Sarái.

Though in the actual state of their general sanitation the villages as a whole compare very favorably with that of some important quarters in the Military cantonment and municipal town, still they are not free from defects which are not only serious evils in themselves but may, and there is reason to believe do, on particular occasions, as of epidemic atmosphere such as has prevailed during the autumn and winter, lead to consequences

of a very injurious and fatal kind—consequences which when of a communicable nature may spread far and wide. The most serious and generally prevalent defects which have attracted our attention in respect to the sanitary condition of the villages we have inspected in the course of this inquiry are:—

1*st*. The pernicious custom which prevails amongst the peasantry of living at least during five months of the year under the same roof, or in a common room, with their cattle; and this without the adoption of any efficient means for purifying the space occupied by the latter. Their dung, it is true, is daily removed and converted into fuel, but their urine is never removed, it soaks into the floor or festers in putrid little puddles in the inequalities of its surface during the whole of the period that the cattle are usually housed. The only respite from this state of things is during the 6 or 7 summer months when the cattle are tethered outside. In the course of this period the floor gradually dries, but does not perfectly recover its original purity before it is again subjected to the same process of pollution, and so on from year to year.

2*nd*. The neglect to provide means for efficient ventilation, or as is too often the case, any ventilation at all. Instances of the thorough neglect of this essential requisite to the salubrity of a dwelling place have been described in the body of this report by way of illustrating its inconveniences and evils, especially when disease invades the circle of the inmates whether they be man or beast.

3*rd*. The want of an organized or recognized system of domestic scavenging and general conservancy, the consequences of which are unnecessary labor and irregular action, which are too often inefficient for the objects aimed at, and which are very frequently altogether neglected as too irksome a daily task.

4*th*. The neglect to protect the sources of water-supply from the common and ordinary causes of surface contamination and pollution, as for instance where a dung-heap is piled up on the edge of a bank immediately overlooking the pool of the village springs, or the carcase of a buffalo or cow is allowed to fester and rot on the surface of the ground in their close vicinity. The first defect, *viz*, that of the family living with their cattle is in the opinion of the Committee one which does not admit of a remedy in the existing condition of the peasant population of this Province. The custom is the result of necessity and not one of choice, for we found that wherever the thing was practicable, the cattle were housed separately. The question is one of individual means, and the man who can afford to do so gives his cattle separate accommodation, though this is always much too close to his own dwelling. One reason assigned for the custom of keeping the cattle so immediately under the eyes of their owners is the fear of their theft or injury by poison or otherwise at the hands of an enemy. And this fear of poison is one reason why the sheds are so carefully closed up against the introduction of anything from without, an air hole being an easy way for throwing in a tuft of grass charged with poison. This last difficulty, however, is not insuperable, and the ventilation might be provided in a manner (as by a chimney flue) to avert the suspected danger, should it really exist. The second defect, *viz*., the neglect to make provision for house ventilation is one that is the result more of ignorance and carlessness than of any general prejudice. In only one instance was the objection urged that an air hole would enable an enemy to throw stolen property in to the house to incriminate its occupants, whilst in every other instance the people looked upon the recommendation as of undoubted advantage to their own and their cattle's comfort, and expressed their determination to adopt the measure we had brought to their notice. In fact, in one house the owner was so in earnest that he drove a hole through the roof of his cattle shed in our presence, and in another the owner at once opened out a smoke hole in the roof of his dwelling room which had been sealed up at the beginning of winter to keep out the cold. To the general introduction of this measure there would be, the Committee believe, no difficulty, as their suggestions for its general adoption were readily accepted by the villagers on the ground of its being an improvement, the operation of which they could understand and appreciate. From what was privately communicated to us, however, by some headmen anxious to see the measure universally adopted in their villages, it appears that some authoritative ruling in the matter will be necessary owing to the want of unanimity amongst the people and their timidity in moving out of the old beaten tracks without the lead and support of an acknowledged superior authority. It was suggested to us that if the village headmen were summoned before the district officer, and after explanation of the objects and advantages of the measure, were directed to use their influence with the villagers of their several wards to provide this sort of simple ventilation in their houses and cowsheds, the people would readily accept the advice, and at once provide the necessary air holes either in the roofs or outside walls. The measure in itself is so simple and so easily executed that the Committee have no hesitation in strongly recommending its introduction by authority as above suggested.

With reference to the third defect, *viz*, the want of an organized or recognized system of domestic conservancy it appears to the Committee that there would be no difficulty in introducing a simple system of domestic scavenging which would greatly improve the cleanliness of the villages and at the same time materially diminish the labor the villagers now expend on their duty. Under the system now in vogue, it is the custom for the villagers to sweep their houses and courts (those who neglect the duty altogether are of course considered to be exceptional cases, as in truth they really are) at least once and sometimes two or three times in the day, and to carry out the refuse and litter to the dung-heap outside the village. The tendency of this daily custom is to make the house-wife shirk sweeping to escape the journey with her dust basket to the dung-heap outside, or else to diminish the distance to be travelled with this load, and consequently the dung-heaps are formed much too close to the village walls, and very often only just outside them. And from this site of first deposit they have to be again taken up and cast on the fields when the time for manuring comes round. It was suggested to the villagers in several places that in our opinion it would be a far simpler process both as saving labor and ensuring a more perfect cleanliness of the village if they make some arrangement for the conveyance of the litter and house sweepings at once direct to the site where it would be ultimately used as manure, and it was proposed to them to construct a dust bin (khak-dan) in one corner of the courtyard by merely enclosing that corner with a low mud wall, such as they are in the habit of building for their cattle-mangers, and instead of carrying their sweepings daily outside the village, to store them in the dust bin till such time as they could conveniently load it and carry it away direct to the field, where it would be hereafter used as manure, say on every fourth or fifth day; the object being to secure the cleanliness of the courtyard by repeated sweeping and a convenient receptacle close at hand. The proposal was freely discussed, and approved on its own merits by the villagers to whose consideration it was offered, and several expressed their determination to adopt it. The Committee believe that there would be no difficulty in the introduction of this system, especially if small pillars were erected at suitable distances round the several villages, and the raising of dung-heaps within them was strictly prohibited.

The fourth defect, *viz.*, the neglect to protect the sources of water-supply from common sources of pollution is not one easily to be remedied by any system of general application in the majority of these villages. But it will be advisable, the Committee are of opinoin, to bring the importance of the duty to the notice of the headmen of the several villages and impress upon them the necessity of their using their personal influence and authority to prevent the casting of filth or the carcases of dead cattle on the surface of the ground in the vicinity of any source of water-supply.

As the result of their inspection the Committee would suggest the adoption of the following measures for the improvement of the sanitary condition of the vilages round this contonment:—

1*st.*—The universal introduction of house ventilation by means of the air holes familiar to the natives and already provided in many of their houses, or by means of chimney flues.

2*nd.*—The universal introduction of dust bins in connection with each house, and the demarcation of village boundaries within which the collection of dung-heaps be strictly prohibited.

3*rd.*—The protection of all sources of drinking water from causes of surface pollution and contaminationr

4*th.*—Regulation to prohibit the villagers from performing offices of nature within the area demarcated fo, the formation of dung-heaps.

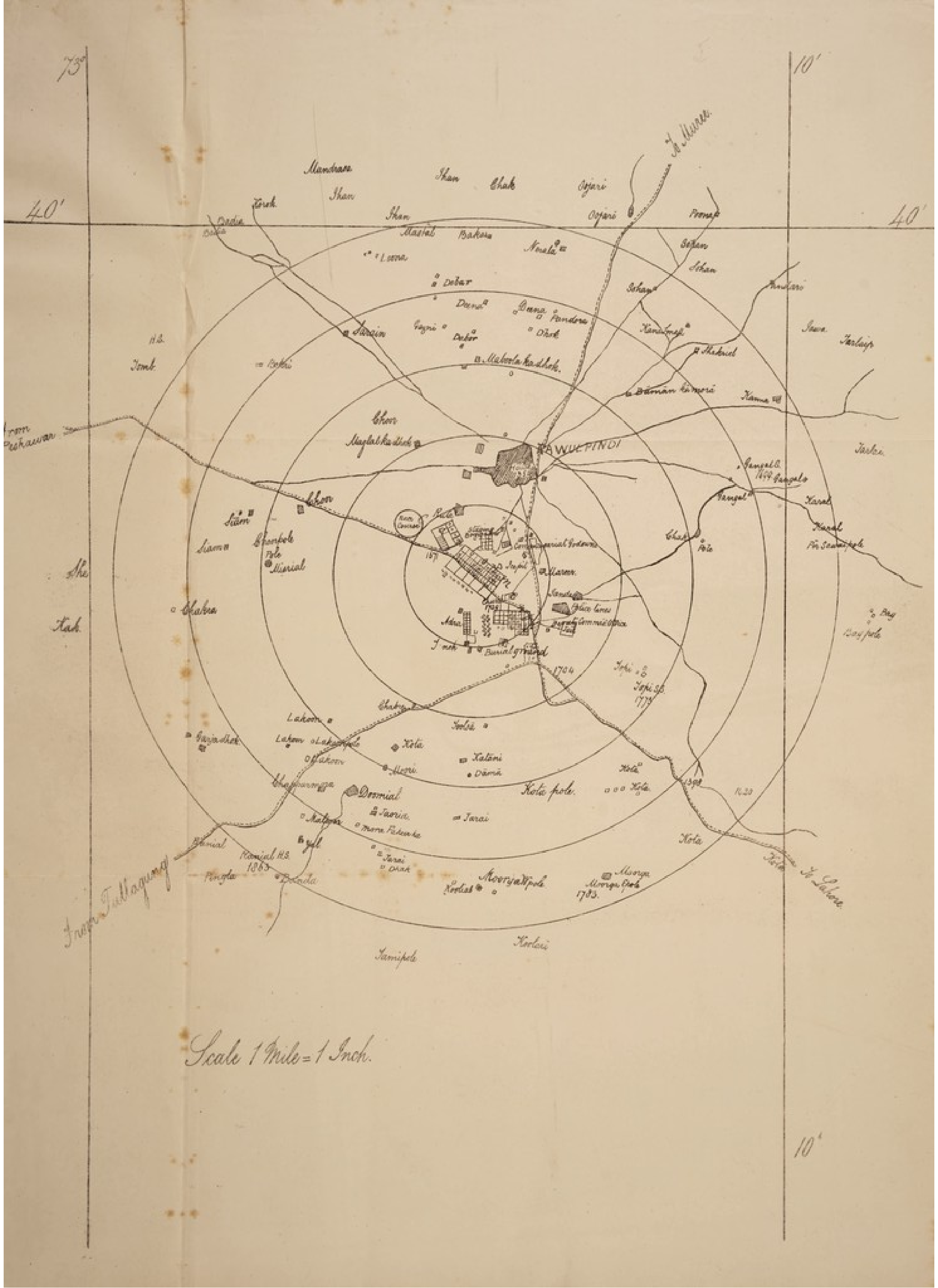
In conclusion, there are two villages which from their close vicinity to, and constant communication with the military contonments, it is advisable in the opinion of the Committee to bring under official control and supervision. They are the villages of Jhanda and Marri. They are situated close to each other, and just beyond the north-east side of cantonments, and are the most crowded, most untidy, and generally the most filthy of all the villages inspected in the course of this enquiry. At present, though the latter contains upwards of 300 (we were informed) head of milch cattle, several of which died during the recent epidemic, they are under no sort of control or supervision, and as they supply the cantonment with a large portion of the milk consumed in it, may be justly considered a soucre of danger to its residents. The Committee therefore recommend that these two villages in so far as regards their sanitary supervision and control be placed under the charge of the cantonment authorities. At the same time it is fair to state, that, bad as is their present sanitary condition, they are in this respect not so bad as some parts of the cantonment Sadr bazár.

(Signed) H. W. BELLEW, Surgeon-Major,
Sanitary Commissioner, Punjab, President.

" A. H. MORGAN, Major, *Offg. Dy. Asst. Qr.-Mr. Genl.* } Members.

" A MEREDITH, *Asst. Commr.* }

Rawalpindi:
21*st March* 1879.


73°
40'
10'
40'
To Murree
RAWULPINDI
From Peshawar
To Lahore
Dhamial
Scale 1 Mile = 1 Inch.
10'

APPENDIX D.

Remarks on cases of Typhus Fever which occurred at Murree and Abbott-abad during the summer of 1878, *by Surgeon Major R. Gray.*

The first suspicious case of fever which I saw at Murree was that of a boy at the Murree Brewery. On going to see him on the 29th March I found out that the boy's father, who was a syce of Mr. Whymper's, had died a short time (eight or ten days) previously, after suffering from fever for about a fortnight. The boy had no complication of lungs or bowels to account for the severity of the symptoms from which he had suffered for eight or ten days before I saw him. The fever was continuous, so far as I could ascertain. When I first saw him, he was semi-conscious, and had wandering delirium at night, and died comatose on or about the 2nd April. Although there was no eruption, I considered that the case was not improbably one of typhus. About three weeks after the boy died, there was another doubtful case at the Brewery, also a syce of Mr. Whymper's.

The first case of undoubted typhus (what at least I considered undoubted typhus) was seen by me early in April in the Murree bazár. The patient was a Sikh priest, who had lately come from Kashmir. The fever was distinctly continuous. There was no lung or bowel complication. For several days there was stupor and delirium at night. The tongue was dry and black. There was sordes on the lips and teeth. The temperature ranged from about 102° in the morning to 103° or 104° in the evening. There was a distinct macular eruption, dark mulberry color (I did not see him till he had been ill for ten or twelve days). For two or three days there was retention of urine which was removed by the catheter. The fever lasted about 15 or 16 days. The case was a severe one, but the priest made a good recovery. Towards the end of April a friend of the priest who had attended on him during his illness fell ill. Alive now to the fact that I had to deal with true typhus, I had this man removed to a shed at some distance from the bazár. Both he and his friends were most averse to his removal from the bazár, and much to my disappointment he was carried off from the shed, and I was unable to observe the course of the disease nor did I discover what had been the result.

The next undoubted case was that of a Kashmiri tailor, servant of one of the house proprietors of Murree. He was admitted on the 17th of May. The man's statement was that he had recently returned from Rawalpindi where he attended on his brother who died of fever, and that a few days after his arrival in Murree he had taken ill. He had continuous fever and a dark macular eruption which was very plainly visible in his case, as he being a Kashmiri had a fair skin. The fever ran its course in about 16 days. It was not a severe case.

A good many doubtful cases were admitted into hospital during May and the two following months. The only other certain case in May was that of a vegetable seller from the bazár. In the beginning of June a baker in the bazár fell ill. The eruption in his case as well as the other symptoms were very characteristic of typhus. I took Dr. Power, 11th Bengal Cavalry, to see him, and after examining him he said he had not seen a more marked case of typhus in Ireland, and he had seen many. The baker's wife accompanied him to the fever ward, and nursed him through the whole of the disease. She was attacked a month after his admission, and had the eruption and other symptoms characteristic of typhus. Another well-marked case of typhus occurred during the month of June, and I had an opportunity of observing it from beginning to end. The patient was the khansámah of Dr. Brown, who was then on sick leave at Murree. About the middle of the month (June) Dr. Brown returned to Murree from a trip to the Gullies and Thandiáni. The servant was well up to the time of his arrival in Murree. A few days afterwards he became feverish. Knowing that typhus fever was about, both Dr. Brown and I examined him often during the first four or five days, but we discovered no eruption. He had during that time quinine daily about 15 to 20 grains, but it had no effect on the fever. On the 6th day from the commencement of the fever an indistinct eruption was visible. On the following day there could be no doubt about the macular eruption. The temperature had been steadily about 102° in the morning, 103° in the evening. The bowels were rather constipated throughout. The attack was not a severe one, and there were no decided head symptoms. The temperature fell to 100° on the 15th day, to about 99° on the 16th, and did not rise again. The man made a good recovery. Dr. Duncan, 11th Native Infantry, saw the case with me, and agreed that there was no doubt as to its being typhus. I took another medical officer to see the case. I did so, because I had heard that he had been giving it as his opinion that typhus fever did not exist in India. When I gave him the history of the case, and before he had seen it, he stated hat nothing would convince him that a case of fever in India was typhus unless the temperature were taken and recorded every two hours. Of course this had not been done; but he looked at the man and gave it as his opinion that the macular eruption was purpura. The eruption, however, disappeared about the 16th or 17th day after the commencement of the man's illness, although the treatment adopted could have had little or no influence on purpura.

On the 5th of August there were two other well-marked cases. The patients were servants (bearers of an officer who had recently come from Abbott-abad. The macular eruption as well as the other symptoms were very characteristic in them. One of them died.

In the beginning of October two Ghoorkas (man and wife) were attacked with fever after they returned from Doonga Gully. Both had the mulberry macular eruption. Of four children who were with them, three were subsequently attacked, but in none of them (the children) was an eruption observed. The last case which has come under my observation was that of a baker in the bazár. When I first saw him, there was no eruption, but on my visiting him two days afterwards it was well marked, and I had the opportunity of seeing it change from a pinkish to a dark brown hue. The fever entirely left on the 11th or 12th day after the appearance of the eruption, and about the 18th or 19th from the commencement of the illness.

Only one case occurred among the European visitors. It was that of a young lady who arrived in Murree about the beginning of July. Towards the end of that month she began to feel out of sorts, in consequence she thought of having got a chill on the 26th. Although suffering from malaise she was able to move

about till the 30th July, when she took to bed. Thinking that she had an attack of ordinary malarious fever, she took some quinine, and did not send for me till the 2nd August. I found her suffering from high fever temperature 104° with white furred tongue, dry skin, &c. Concluding that the fever was probably of a remittent type. I prescribed a diaphoretic mixture and quinine. On the following day (3rd August) she had grains xx quinine, and on the morning of the 4th grains viii. She was then cinchonised, but there was no abatement of fever. On the morning of that day my attention was directed to a macular rash of a darkish brown color which covered the trunk, neck, and arms. The friends told me that they had observed the rash on the previous day.

Notes of first case with temperature chart.

5th August.—(7th of illness) 9 A. M., slept little during the night, eruption seen on palms of hands as well as on trunk and arms 7 P. M.—Bowels opened twice during the day. *6th* 5, A. M. slept a little at intervals during the night. Bowels moved once this morning. 8·30 P. M.—Bowels moved thrice during the day. *7th*, 8 A. M. Had a better night. Eyes now considerably injected; lips dry; (bowels twice moved during the day). *8th*, no change in symptoms. Temperature very high 104° mane; 105·1° vesp. Dr. Brown, Principal of the Lahore Medical School, saw my patient with me, and agreed with me that it was undoubtedly typhus. *9th*, 8 A. M., much in same state as yesterday. Urine passed freely, contains no albumen, was sick and vomited once during the night. Bled slightly from nose to-day. Tremor of hands and subsultus. *10th*, Inclined to be delirious towards night, hair to be cut, and ice applied to head. *11th*, Tongue dry, and dark in the middle. *12th*, Wandered a good deal during the first part of night, eruption less distinct. *13th*, Had a good night. *14th*, Eruption on chest still faintly visible; gone from the arms. The young lady was left in a very weak condition, but she made a very satisfactory recovery.* During convalescence there was disquamation of the cuticle, and the hair came out in large quantities.

It appears to me that the above is as typical a case of typhus fever as one would* see anywhere †. I regret much that my duties were so heavy during the summer months as to render it impossible for me to take detailed daily notes of the cases of typhus which came under my observation among natives in the station. Had I been able to do so, I have no doubt that they would have been proved as clearly to be cases of true typhus as it seems to me, has been the case of the European visitor.

I am far from supposing that the cases of typhus among natives which I have described in somewhat general terms in the beginning of this memorandum were the only ones that actually occurred in the station. No doubt some occurred that I never heard of, and besides the two to which I have alluded on pages 1 and 2, there was a considerable number of cases which I was obliged to consider doubtful in consequence of not having been able to see them sufficiently often or to study them with sufficient care. Moreover, when the skin is very dark, shrivelled and covered over with numerous cicatrices of boils, &c., as is often the case with poverty-stricken natives, it is most difficult to be certain whether a macular rash is present or not.

It is impossible to say how or from what place the infection was introduced into the station. It is well known that in the early part of the year the inhabitants of Poonch and Kashmir suffered terribly from famine, and hundreds of starving creatures from those countries found their way into Murree. One naturally suspects that in some way they were the means of infecting the station. Still there is no proof that they were.

About the same time that I observed the first case of typhus fever here, fever in an epidemic form broke out in the district of Hazára, in which there was great scarcity if not actual famine. My deeply lamented and most esteemed friend, the late Dr. Johnson, was then Civil Surgeon at Abbott-abad, and with characteristic zeal and energy he set about investigating the nature of the epidemic. After he had been at work for about a month, he wrote to me that he was convinced the epidemic was a mixed one of typhus and relapsing fever. He himself fell a victim to the disease (typhus). He had served with his Regiment through the Jowaki campaign, and was in a low state of health when he returned to Abbott-abad. Doubtless his incessant labors in connection with the fever epidemic still further reduced his health below par, and may have rendered him more susceptible than he would otherwise have been to the influence of the typhus infection. Be this as it may be, he fell ill on or about the 7th May, and died on the 19th of the same month. Dr. Grant, who officiated for him as Civil Surgeon of Abbott-abad, had also an attack of typhus fever. Dr Johnson not only attended him, but took him into his house and nursed him, and it was during Dr. Grant's convalescence that he sickened.

Dr. Johnson took notes of Dr. Grant's case and of some others, and it was his wish that they as well as his own case (the notes of which were taken chiefly by Dr. Bookey) should be sent to a friend of his. Before sending them on, I have taken the liberty of copying out the rough notes of some of those cases, and forwarding them along with the notes of his own case.

It is right that I should explain, that the accompanying are not the notes of all the cases that were taken by Dr. Johnson during the fever epidemic. I have selected only such of them as appear to me to be cases of typhus fever: some of the rest seem to be cases either of remittent or of relapsing fever, while others are doubtful.

The history of the epidemic fever in Abbott-abad and in the Hazára district could only have been written by him who so zealously devoted himself to its investigation, but it is hoped that the notes will do something towards setting at rest a point of great importance, *viz.*, whether typhus fever exists in India or not. One of the greatest living authorities on continued fevers, Murchison, has given it as his opinion that facts which have been brought to light regarding previous epidemics of fever in the Rawalpindi Jail and elsewhere have proved that typhus must now be regarded as an Indian disease. But this conclusion is not admitted by all medical men in India; and any new facts that may be brought to bear upon the point are of great importance, especially at a time when large numbers of troops are collected in the neighbourhood of places where typhus fever is reported to have occurred.

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* Soup, milk and Champagne were given almost from the commencement of the illness.

† The notes are exceedingly short, and the temperature chart must be read along with them.

Case No. II.—Dr. Grant æt. 30.—Had been feeling heavy and restless since afternoon of 5th April. On afternoon of 8th had a violent rigor followed by pyrexia (*temperature* 102), and profuse diaphoresis during night. Aperient medicine taken in the afternoon acted once or twice, and he also took 15 grains Quinine. *9th April Morning.*—Pyrexia is still present but in a mild form, *temperature only* 99, *pulse* 84. Tongue covered with white coating, skin soft and moist, no enlargement or tenderness of abdominal organs. Eyes congested, great pain in orbits, also pains in back and lower extremities. Is thirsty, and has no appetite. *Evening.*—Somewhat distressed and restless, pains in limbs annoying; *pulse* 100, *temperature* 102. Took some arrowroot and soup. There is slight nausea, no vomiting. To have Quinine, grains x and chloral one scruple at bed time. The former was given at 9 P. M. when *temperature* was 100. *10th. Morning.*—Is altogether much better and easier, perspiring profusely. Slept well. Tongue clearer, bowels moved once loosely; temperature 100, pulse 84. Eyes still congested and painful, and pains in back and lower extremities are troublesome. The elbows are also painful, but there is no swelling. Has some inclination for food. To have 15 grains Quinine at once. *Evening.*—Has had alternate flushes and chills all day; no great thirst; disinclination for food. Tongue very creamy, complains most of orbital and supra orbital pain, and both eyes are deeply congested. Pains in back and limbs annoying. The skin is moist and diaphoresis often profuse. The congestion of eyes is very marked and globes are very painful. He read much to-day, and condition of eyes is probably due to this cause. No vomiting or pain in head. Bowels moved once slightly; *temperature* 101·8, *pulse* 84. To have four leeches on each temple. Also chloral a scruple with grains xv Bromide Potass at bed time. He takes jelly, soup &c. fairly. *11th. Morning.*—Had a fair night, and seems cheerful and improved this morning; tongue cleaner, skin cool and moist; *pulse* 84, *temperature* 99·2. Has some appetite. Congestion of eyes less marked and aching of eye balls also less severe. To have grs. xv Quinine at once. Farinaceous food or soup every 3 hours and two weak pegs. *Evening.*—Was pretty bright and well all the morning. At 12·30 noon his *temperature* was 100. At about 1 P. M. he began to be conscious of discomfort, and after that had alternate mild chills and flushes for the rest of the day. Skin always soft and sometimes perspiring. Ate sago and soup every 3 hours. Eyes are again congested and aching, but not to same extent as yesterday. Tongue creamy; *pulse* 85, *temperature* 101·4. To have a draught similar to last night's if absolutely necessary. There is singing in ears from quinine. *12th. Morning.*—Tossed about until about midnight when he took chloral draught, but even with this he had little or no sleep. Is drowsy this morning, and has no appetite. His skin is moist; tongue white and coated; *pulse* 85, *temperature* 102; eyes congested and painful. To have 3 leeches on each temple; an ounce diaphoretic mixture every 2 hours, soup and food as yesterday. *Evening.*—Has had a troubled and bad day, constantly feeling alternate chills and flushes, but took soup, jelly, sago &c. steadily every 2 hours. At 2 P. M. the *temperature* taken under tongue was 103·8, the *pulse* at the same time 85; skin keeps moist, and urine is passed freely, head and eyes ache. Great muscular pains continue to harass him, and he is unable to get much sleep, dozes off occasionally and intellect is somewhat confused on waking up. His *temperature* under tongue is now 104 and pulse 86. He vomited once at 5 P. M. Has taken medicine regularly. Respirations are about 24; urine abundant, high colored, free from albumen. sp. gr. 1028. To have Chloral Hydrat. grs. xxv with Bromid. Potass. grs. xv at bed time. *13th. Morning.*—Dozed off and on all night, and woke up feeling better and free from headache; took soda water and milk during night when thirsty. His tongue is very white and creamy. *Pulse* good 88, and *temperature* 102·8. Continued diaphoretic and food as yesterday. *Evening.*—Bowels moved four times during day from oil. Has had some abdominal pain and trouble. There is little or no change otherwise. Fever continues, and eyes are red and painful. *Temperature* at noon was 104. It is now 103·5 and *pulse* 86. Tongue in same state. To have pulv. cretæ arom a scruple at once. *14th. Morning.*—He passed another loose motion at 8 P. M. last night, and got a second chalk powder at 9 P. M. with 25 grs. Chloral at bed time. The milk also which he drank at night was boiled. He slept off and on, but was disturbed by headache and visions. His eyes are deeply congested, tongue very thickly coated with dense fur but moist, no spots on his body, some gurgling but no pain in belly on pressure. Urine about 1 pint passed at 6 A. M. this morning, high colored; *pulse* 86, *temperature*, 103·5. To have boiled milk and thin arrowroot, also beef-tea every 2nd hour. To have grs. xv Salicylate soda with Tinct. Zengib. m x and aqua one ounce every third hour, also small blister on each temple. *Evening.*—Diaphoresis has been moderately profuse off and on all day, but there has been no reduction of *temperature* which has stood steadily at 103·5. Thirst has been great, and he drank fluids in large quantities; headache is very distressing and eyes deeply congested. Head complications are to be dreaded as crisis. Tongue moist and coated. He has had four doses of silicylate of soda, and it is to be continued every 3 hours. No further action of bowels, and abdomen is free from pain. 1lb urine was passed at 3 P. M. To have small blister on each temple tonight; *pulse* strong 88, *respirations* moderately deep 24, 10 P. M. temperature 104, chloral grs. xxx h. s. s. *15th. Morning.*—Restless all night, but dozed at intervals. Is weary, mental faculties quite clear. Eye congestion very marked, tongue unchanged. Passed urine largely at 10 P. M., and not since, skin is most often perspiring, and he takes food such as soup, arrowroot &c. regularly. No motion. Blisters on temples have risen well. To have salicylate mixture every 3 hours, ice to head, food as before, *pulse* 90, *temperature* 103·2. *Evening.*—Has been in profuse diaphoresis all day and slept for a couple of hours in the morning but there is no abatement of symptoms, *temperature* was 102·8 in middle of day, has now risen to 103·5 and *pulse* is 96. Skin is bathed in perspiration but headache and distress are worse than ever. Thirst is great, little or no appetite. Omit salicylate and give nitre whey. The *temperature* at 12 midnight was 104. Chloral grs. xxv was given then. *16th. Morning.*—Had heavy sleep from midnight to 7. A. M. Ice was kept on his head and seemed to afford relief, his skin was moist all night. No abatement of symptoms to-day. Aspect is heavy and dull. Eyes congested, headache present. Tongue densely coated with dense white fur. He passed urine freely at midnight, no vomiting or diarrhœa, no great thirst, salicylate produced deafness and no relief. Is prostrate and unhappy about himself, *pulse* 96, *temperature* 103·4. To have Murchison's acid mixture every 3 hours. Food in small quantities every 2 hours and 4 ounces of wine. Trunk and limbs studded with a rough eruption which came out yesterday. *Evening.*—Restless all day, no actual delirium but is at times confused and obfuscated, skin was dry until afternoon when he began to perspire profusely. The typhus rash is very distinct on his trunk. Headache is less great. His *temperature* was never 104 since midday and *pulse* varied from 90 to 96 Has taken his acid steadily, also food every 2 hours, urine pale amber, Sp. Gr. 1025, phosphatic but quite free from albumen. *17th. Morning.*—Slept from midnight until about 4. A.M., seems more tranquil mind at times confused and wandering, *temperature* 102·5, *pulse* 88. Tongue coating very thick and dusky. *Respirations* are reduced to 22. Frontal and orbital aches are less constant and distressing than before, no motion

of bowels since night of 13th. To have an ordinary enema of water. *Evening.*—Had a favorable day resting more than usual. *Temperature* at one time fell to 102, mental faculties are more upset to-night than usual. He takes longer to rouse up. When he was being washed to-day I noticed that the whole body and limbs were covered with typhus rash, the spots on back darker than those in front. He has taken food well, but he rambles and talks incoherently, skin hot. *Temperature* 103, pulse 96. *18th Morning*—Slept with tolerable ease from midnight until 5 A. M. but swears he never closed an eye. Is quieter and more collected this morning, no improvement in tongue. Eyes still heavy and congested. Aspect heavy, *pulse* 96, intermits one beat now and again. Skin soft, *temperature* 102·5, injection was not given yesterday but he has just had it now. Rash present, injection has just brought away a very large motion formed and light in color. *Evening.*—No better but more drowsy and difficult to wake up. Takes nourishment. One ounce of spirit with yolk of egg given 3 times to-day. His *temperature* since midday has been 103 and *pulse* from 90 to 99, slightly dicrotous and dropping one beat now and again. No urine has been passed since early this morning. 10 P. M.—Passed 20 ounces urine, sp: gr. 1020, light colored, faint sign of opalescence on usual albumen tests. *Respirations* 28, *temperature* 103·3. *19th. Morning.*—Had food every 2 hours during night and slept moderately well. Total quantity of urine in 24 hours was 5 ounces. He is more tranquil and collected this morning. *Pulse* is firmer 84. Temperature 102, skin moist, no inclination for food. Tongue unchanged and trembles. Hands also tremulous with slight subsultus tendinum at wrists. Quinine 10 grains at once. Eggs and rum 4 times a day, beef-tea, and milk every two hours, no urine passed yet, *respirations* 24, acid mixture to be continued. Passed abundant urine at noon. *Evening.*—Has been in a heavy lethargic state all day, roused up now and again for food and medicine, but at once lapses off into sleep again. Twitching at hand and some subsultus of wrists are observed during sleep. Complains of dimness of vision and defective hearing. Headache not so bad. Tongue in same state, moist, coated. *Pulse* 86, firmer in character since stimulants have been given every 3 hours. Temperature has been at 103 since midday. Skin moist, *respirations* 26. Urine 20 oz. at 10 P. M. *20th. Morning.*—Had a troubled night owing to bad weather with thunder and lightning. Is tranquil this morning, very prostrate and very somnolent. Has taken food regularly and has one ounce wine every 3 hours. *Pulse* dicrotous (86) and yet very rapid and feeble, if he even lifts a hand. Tongue is unchanged. Headache less, 20 ounces of urine were passed at 4 A. M. this morning. *Respirations* 24, wine and egg to be continued every 4 hours, acid diuretic every 3 hours. He dislikes being roused up and complains of annoyance from frequent repetitions of food. *Temperature* 101. To have 20 grains of quinine in divided doses within an hour. At 11—20 passed urine freely which was light in color, at 3—30 plentiful urine, sp. gr. 1012, pale amber in color no cloudiness on usual tests. *Evening.*—Very weak all day, and depressed about himself, skin usually moist, complains off and on of headaches, and was tremulous, but took food steadily, very somnolent. *Pulse* at times weak and dicrotous 84. *Temperature* 102·5, no change in tongue. Midnight—*pulse* weak, even, 84, temperature 100·4, urine 20 ounces passed. *21st. Morning.*—Critical and somewhat plentiful diaphoresis all night, sleep heavy placid. Looks a new man to-day. No change in tongue. Skin is bathed in moisture. *Pulse* weak, and even, 84, *temperature* 100. To have 10 grains quinine at once. Continue treatment. An enema at 9 A M 12 noon—skin still moist, *temperature* 99·5. *Evening.*—Had a fair day, languid and prostrate, but cool and sensible. *Temperature* stood at 99·5, until this evening when it rose to 101·2. Skin is always moist and *pulse* stronger than before, 84. He takes food regularly and the tongue is beginning to clean from tip. Eruption still visible. Respirations are 24 at midnight. *Temperature* was 99·5. *22nd. Morning.*—Passed urine at midnight and early this morning, perspired more or less profusely all night, skin is now moist, does not feel so well to-day—nasty taste in mouth, slight headache, and temperature has risen to 100·5, to have 3 drachms ol. ricini and grs. x quinine at once, *pulse* 84. *Evening.*—Oil caused griping and tympanitis without any action of bowels, and it was necessary to give an enema with tincture asafœtida at 3. P M. which brought away much wind and fœces; at 3·30 he also got 3 drachms Tinct Rhei Co. with m xx spirit chloroform. His skin is always moist. Tongue still coated. There is no appetite, typhus eruption is still perceptible, *temperature* 99·4, *pulse* 80; food in future to be given at intervals of 3 hours and he is to have 3 glasses of claret daily; also to have calomel grs. j pil. rhei co. grs v at bed-time. *23rd. Morning.*—He slept well last night and had profuse sweats. Tongue is cleaner to-day, but there is no appetite. *Temperature* 99, *pulse* 84. Feels utterly weak and prostrated, no motion of bowels, and he has no pain or discomfort from tympanitis. *Evening.*—Has had a fair day, sleeping and perspiring freely, enjoyed soup and arrowroot. No trouble with abdomen, tympanitis has subsided. Tongue is also moister and cleaner, at 3 P. M. he got quinine grs v, *pulse* 46° *temperature* 98·4. This is the first time that his temperature has been down to normal standard. Continue treatment and food. Eruption still visible on trunk. *24th. Morning.*—Slept well, skin is now cool and moist, tongue improving, the tip and sides have improved in color and coating is wearing off. Had some appetite and enjoyed rum and milk, *temperature* 97·5, *pulse* 68; no abdominal trouble but bowels have not acted since enema was given on the 22nd. To have 3 drachms ol. ricini at once. Food every 3 hours and 3 glasses claret. *Evening.*—Had a fair day, no fever, took soup and slops, but refused all solid food, skin moist; tongue cleaning but a thin white deposit taking the place of the old thick one. *Pulse* 80 *temperature* 97·8. Bowels moved twice loosely. *25th. Morning.*—Progress favorable; slept well. Is picking up strength, appetite not yet returned. Tongue has improved in color at tip and edge, the coating is also thinner; *pulse* 68, *temperature* 97·8. To have an ounce of following mixture 3 times a day. Strychnine Gr. 1 Acid Mur. Dil. 4 ounces Tinct. Cinchon. Co. 1½ ounces Aquæ 22 ounces. The eruption fading, but has not altogether disappeared. *Evening.*—Ate and slept all day, skin moist, spirits good, no appetite. Eruption fading away and scarcely perceptible, no motion of bowels; *temperature* 98·8, *pulse* 72. *26th. Morning.*—Slept well, improving, no appetite, *temperature* 97·4, *pulse* 80; continue tonic. Bowels not opened. *Evening.*—Progressing well. Ate biscuits. Tongue very clean. Bright and cheerful. *Pulse* 80, *temperature*, 98·4, bowels confined. To have pil. hydr. grs. iij pil rhei. co. gr. v h. s. s. *27th. Morning.*—Doing well; pulse and temperature normal, tongue clean. Appetite has not returned nor have bowels been moved as yet.

Case No. III.—Morley F. child aet 9. Began to ail on Tuesday 16th April with headache and malaise and lost appetite. Doubtful fever on 17th and 18th at any rate she was seized with a strong rigor at 7 P. M. on 19th, and temperature and pulse at once rose. *2nd day*, 21st *April. Morning.*—Aspect heavy and oppressed, eyes greatly congested. Face flushed, lips dry, skin harsh and hot. Tongue coated with red papillæ peeping through scarlet, tip and edges rather moist. Frontal headache, great thirst, no appetite. Bowels confined, slight cough, nothing abnormal in abdomen, urine scanty and high colored. Surface of body generally covered

Records of Temperature, Pulse, Respiration and Excreta.

Name_Miss M.L. Age.22. Disease_Typhus Fever. Result_cured.

Days of Disease.		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.		
Month and date.	August.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
Centrigade.	Fahrenheit.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.	M. E.
41°	106°																		
	105°																		
40°	104°																		
	103°																		
39°	102°																		
	101°																		
38°	100°																		
	99°																		
37°																			
Normal Temperature.	99°																		
	97°																		

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with indistinct mottling, pulse 124, respirations 40, *temperature* 104, cold to head. Acid mior abcon m x spt. ether nitr m x tinct. degitalis m. iij aqua oz. iv ft. haust every 2 hours. Back pains. *Evening.*—Pulse 132, temperature 105, much in same dry state. Eyes heavy and congested headache less, pains in legs. 22*nd. Morning.*—Strong fever all night, delirious at times. Pains in legs troublesome, less headache, but eyes are congested and face flushed. Has at times a craving for food and takes nouri hment with difficulty. Bowels not opened for 3 days. Tongue unchanged, coated, but moist, mottling more distinct on chest and trunk, *pulse* 120, *temperature* 105·2. 23*rd, Morning.*—Had a better night. Confused and stupid on waking up. Bowels acted once slightly. Face flushed, skin keeps dry. No alteration in tongue, no complaints of pains. Eyes congested, mottling very distinct, pulse 112, temperature 102·4. To have ol. ricini 2 drachms at once, continue acid. 24*th, Morning.*—Had a restless and disturbed night and coughed off and on Aspect is now distressed and stupor somewhat heavy. Breathing shallow and rapid, 30, nostrils distended. Some cough. Right lung dull on percussion and only bronchial sounds are heard, elsewhere good, vesicular breathing is audible. There is no complaint of pain but base of right lung is evidently congested, *pulse* weak 120, *temperature* 102·5. The trunk is studded with typhus rash. To have poultice to right lung and ipecac spt ether nitros with mixture every two hours, also to be fed every 2 hours, 2 ounces sherry in the 24 hours. *Evening.*—At times slightly delirious and rambling, skin hot and dry, breathing oppressed, *respiration* 40. No cough, great thirst, *temperature* 104 *pulse* 130. Continue treatment and food as in morning. No motion, passes urine freely. 25*th, Morning*—Restless, rambling, and delirious all night, seems easier this morning. Bowels have been opened once; respirations are quieter and less laboured. Has some cough and expectoration with rusty tint, skin dry and hot, mottling present, physical chest signs unaltered and point to congestion of base of right lung. Tongue rather cleaner. *Temperature* 103, *pulse* 112. Continue chest poultices and wine, medicine and food as yesterday. *Evening.*—Has had a favorable day, no delirium and but little cough. Expectoration very scanty, tenacious and rusty. Respirations rapid and shallow, 40. *Pulse* 108, *temperature* 103·2. Has had some headache. Bowels moved once naturally. Passes water freely, eyes continue congested. No change in treatment 26*th. Morning.*—Had a better night. Troubled with cough. Expectoration rusty and so tenacious that she feels difficulty in getting rid of it. Tongue is cleaner and red, with enlarged papillæ. Eyes injected, lips and teeth dry *Pulse* 108, *temperature* 103·2. Bowels moved once loosely during night, *respiration* 40, mottling very distinct particularly on back. Continue treatment and give port instead of sherry. *Evening.*—No great change, seems more tranquil, skin hot, *pulse* 108, *temperature* 104. Not much cough, takes nourishment well, bowels have been moved once loosely since morning. Aspect is on the whole brighter, respirations between 40 and 50. Continue treatment and give chlorodyne m x, if necessary. 27*th. Morning.*—Easier and better. Slept fairly. But little cough or expectoration, *pulse* 104, *temperature* 101·4. Continue mixture and port wine, bowels moved once loosely this morning and m x chlorodyne were given. *Evening*—Had a fair day, sleeping a good deal, slight cough in afternoon. No motions, passed water. Takes food fairly *pulse* 108, *temperature*, 104. Tongue dry, glazed, with prominent papillæ. Skin nearly always dry. Continue treatment. 28*th. Morning.*—Perspired profusely, and slept fairly through the night—skin is now moist. Tongue clean and moist. *Respiration* rapid, 30, *pulse* 104, *temperature* 101·2. Coughs now and again, mottling distinct on trunk and limbs. Bowels not moved again. Continue acid mixture and port wine, soup, milk, and arrowroot. *Evening*—Somnolent all day, skin moist often perspiring—mental faculties bright, generally more tranquil and had a greater inclination for food. Ate a biscuit to-day 3 times, *pulse* 100, *temperature* 102·4. 29*th. Morning*—Had a quiet night, aspect tranquil and eyes look natural, lips dry and cracked. Tongue moist, skin soft covered with sudamina, *pulse* 96, *temperature* 99·4.—Has some appetite and eats biscuits with her milk. No further motion of bowels. Quinine grains v at once; continue acid and port wine. *Evening.*—Nearly free from fever all day, one motion, temperature 101. 30*th. Morning.*—Slept well, is tranquil and cool, *pulse* 92, *temperature* 98·8.—Has some appetite; tongue moist, covered with thin white coating, skin soft. No great diaphoresis. Continue acid, once milk and soup. 1*st May. Evening.*—No fever since last report. *Pulse* 80, *temperature* 98·6, tongue clean, appetite improving.

Case No IV.—*Abdool Ghufur*, prisoner, aet 22, was seized with fever preceded by sharp rigor on 19th, a purgative was administered and acted freely, and man was transferred to tent on evening of the 20th. 2*nd day*, 21*st April, Morning.*—Has pyrexia with hot dry skin. Great back pain, and violent frontal headache. Eyes watery and injected. Urine scanty and burns. Tongue coated, little dry in centre. Spleen enlarged, liver tender. *Pulse* 84, *temperature* 101·4. To have acid mixture every 3 hours and rice and milk. Thirst great, some appetite. *Evening.*—Little or no change; *temperature* 104. Continue treatment and give lime-juice sherbet. 22*nd April. Morning.*—Skin still hot and dry, bowels open. Great frontal and other pains, *pulse* 84, *temperature* 102·2. Tongue coated, pyrexia worse. Tongue clean and red, *temperature* 104·2. 23*rd April. Morning*—Sleep. disturbed. Headache bad, bowels confined and pain in abdomen. Tongue red, eyes injected, skin dry, never perspires, *pulse* 80, *temperature* 103. Great thirst, no appetite, no eruption. Continue acid. *Evening.*—Skin continue dry, *temperature* 104. 24*th. Morning.*—In same state of high pyrexia with dry hot skin. Eyes suffused, rambling at times, great frontal headache. Pains in back and limbs, *pulse* 80, *temperature* 103·4, great thirst. Tongue parched; no eruption. *Evening*—No change, restless and distressed with fever, *pulse* 84, *temperature* 105·1. Continue acid mixture; bowels moved scantily to-day. 25*th. Morning.*—Had a bad night and is no better, skin still hot and dry, *temperature* 104·2, *pulse* 88, mouth dry Tongue dry at tip, and furred behind. Eyes suffused. Frontal pains and also pain in legs. Liver and spleen are both tender on pressure, no eruption, bowels have not moved for 3 or 4 days. To have 4 drachms ol. ricini at once, acid mixture. *Evening.*—In same dry state with great thirst, dry lips and mouth, *pulse* 94, *temperature* 103·8. No eruption. 26*th. Morning.*—In same dry state, great headache, eyes injected, mouth, teeth and tongue dry, great thirst. Indistinct mottling on chest and trunk, liver tender, *pulse* 96, *temperature* 102·6. Continue treatment. *Evening.*—*Temperature* 104·2. 27*th. Morning.*—More or less delirious last night, mottling more distinct particularly on back. Aspect heavy and dull. Eyes congested, lips and teeth dry. Tongue dry and red, pain in limbs. Bowels moved once, *pulse* 100, *temperature* 103·2. *Evening.*—In same state, delirious off and on all day, *pulse* 112, *temperature* 104·2. 28*th. Morning.*—Restless and delirious all night, eyes much injected, great headache. Dry throat great thirst, no appetite, skin always dry. Typhus rash is now very distinct on chest and back.

Tongue red and dry with prominent papillæ, *temperature* 103·4, *pulse* 90. *Evening.*—In same state, *pulse* 96, *temperature* 104. 29*th. Morning.*—Delirious and restless, skin keeps hot and dry. Tongue red and dry, prominent papillæ, indistinct mottling on chest, great thirst, *pulse* 100, *temperature* 104. *Evening.*—Much in same state, *pulse* 100, *temperature* 103·8, *respiration* 30. Bowels open. 30*th Morning.*—Delirious and restless all night, no diaphoresis Headache, congested eyes, mental faculties confused, great thirst, mouth and teeth dry. Tongue parched and dry with enlarged papillæ. Typhus rash very distinct on sides and back, *temperature* 102·2, spleen and liver are both tender. *Evening.*—Worse, skin still dry, *pulse* 100, *temperature* 104.2. *May* 1*st Morning.*—Had a more tranquil night, delirium less than before. Tongue is moister than yesterday. Skin still dry, *pulse* 100, *temperature* 102, bowels confined, thirst great, oil ricini oz. iv at once. *Evening.*—In same state, *temperature* 103, two motions from oil. 2*nd Morning.*—Had some sleep, and fever has almost disappeared, *pulse* 80, *temperature* 100·2. *Evening.*—Is troubled with cough. Tongue glazed, *pulse* 86, *temperature* 101·4, eats fairly, is weak. To have 4 oz. rum and cough mixture. 3*rd. Morning.*—*Temperature* 99. *Evening.*—98·1. 4*th.*—Cough much better. Pain in head and abdomen, *temperature* 99. 5*th.*—Cough better, *temperature* 98·4. 6*th.*—Doing well. 7*th.*—Free from fever but has little or no appetite, tongue moist and clean.

Case No. V.—Dr. Johnson æt, 44. On the 7*th of May* 1878 had nausea and general malaise. Took 2½ grains of calomel, which acted freely till 12 o'clock, on the 7th. On the 8th felt worse, very hot, feverish, no appetite. *Pulse* 86, *temperature*, morning 101, evening 102·6. 9*th May.*—Fever much higher *temperature* 103, *pulse* 90. Twitching at the wrists. Tongue dry and brown at the back, skin dry, ordered soup and milk diet every three hours. Taking a diaphoretic mixture. *Recipe.* Acid nit. hydrochlor. dil. m. × every three hours; slept badly, was restless. 8oz. high colored urine passed. Feels pains in the bones. 12 *noon.—Temperature* 103 5, *pulse* 88, more flushed but quieter in every way, skin moist. 4-30 P. M.—*Temperature* 103·6, *pulse* 104, skin moist, face flushed, eyes suffused. 8 P. M.—*Temperature* 103·6, *pulse* 98, restless, hot, has passed urine. Headache worse, ice applied which gave relief. 10*th May.—Temperature* 103·8, *pulse* 94, slept fairly during night, much distressed by the fever, headache troublesome, slight perspiration, tendinous movements in the wrists, eyes cleaner, skin dry, complains of pains in the back. 12 *noon.—Temperature* 103·8 *pulse* 108. Tongue moist, furred at the back, no tendency to wandering. 3 P. M.—*Pulse* 96, *temperature* 104·1. Face becoming dull and congested, groans with each expiration skin moist, tongue coating white, clean at tip and middle for about an inch. Doubtful spots on chest and abdomen. About ½ an hour ago stomach violently sick after which has had eructations of air for sometime which gave relief, abdomen tympanitic, ordered asafœtida with former mixture as the heart's action has become extremely weak and irregular with a feeling of oppression. Still groans with every expiration. *Pulse* 100, very weak and irregular; *temperature* 103·5. Tincture catechu per anum. 11*th*—Passed a bad night, great oppression of the respiration with flatulence, vomiting. This morning ordered a diffusible stimulant mixture. Obtained a little relief, went into a kind of doze afterwards. Abdomen tense, no doubt about the spots which are more marked, and new ones have appeared. Dozed a little during the night; very irritable but not much confused. *Temperature* 102·8, *pulse* 98°. 12 *noon.—Temperature* 102, *pulse* 86, had a soft standing motion. Flatulence very troublesome. Took a mixture of spts. chloroform which appeared to give relief. Warm fomentations were applied to the abdomen. Face more congested. Intellect clear, tongue moist and foul, greyish white, urine 20 oz., specific gravity 1030, acid color amber. No albuminous deposit, spleen slightly enlarged. 3-30 P. M.—*Temperature* 102 5, *pulse* 92, still: suffers much from flatulence. Had a small dose of strychnia. 8 P. M.—*Temperatur* 103·9, *pulse* 104, is a little incoherent and talkative. Thinks he has intussusception and typhus fever. Face flushed, much distressed by flatulence. 12*th—Temperature* 103·8, *pulse* 98. At 10 P. M. last night had a ½ grain morphia hypodermically injected. Dozed during the night. Took usual amount of nourishment; still groans with expiration, says flatulence is much relieved, abdomen less tense, countenance paler. Centre of cheeks flushed. Had a small motion, passed with much wind this morning. Urine small in quantity, skin moist, spots more marked, no fresh ones, more sunk in bed. Decubitus chiefly on back, inclined to be talkative. Intellect not in the least confused except after a lengthened conversation, tongue large and moist, typhus spots well marked. Takes 4 oz. brandy daily with his food. 12-30 *noon.—Temperature* 104, *pulse* 96. Typhus stupor has made its appearance, much less talkative, constantly dozing, skin moist, mind clear, still voice slightly tremulous, tongue moist and of a dirty white color. Takes his food and medicine. 4 P. M.—*Temperature* 103·9, *pulse* 108. Had very profuse perspiration which wet all his bed clothing. Is very thirsty, pulse of a good character, subsultus not increased; passed urine of a red color. To continue the acid mixture. Flatulence slight. Pains in head relieved by the application of ice, vision very acute although there is some photophobia and redness of the conjunctivæ. Strychnia to be stopped. 7-30 P. M.—*Temperature* 103·8, *pulse* 94. had a small watery motion. Skin moist, otherwise as before. Says he feels weak. 13*th—Temperature* 102, *pulse* 96. Passed a fair night, dozed a good deal. Ordered strychnia mixture, passed a large liquid stool at 2 A. M. last night, condition generally unchanged. Urine passed freely, lateral decubitus. Muscular twitchings. 12 *Noon.—Pulse* 98, *temperature* 103·1, urine Sp. Gr. 1034 and dark in color, mucous deposit, albumen traces as before, flatulence better, at least less distressing. Has taken a dose of chalk mixture. Has had one motion since morning. Mixture of digitalis stopped. 4 P. M.—*Pulse* 100, *temperature* 103·1, *respirations* 26. Tendency to vomiting and flatulence: skin moist, otherwise unchanged. Sponged his body with vinegar and water, and had him removed into another room. 7 P. M.—*Temperature* 103·2, *pulse* 96. One stool more solid than before. Passed urine freely; gloomy and more quiet. Has a bad opinion of his case. Had no acid mixture to-day, eyes slightly yellow. No tendency to delirium, vomited a quantity of semi-digested food with a very acid smell. 14*th—Temperature* doubtful as he would not allow the thermometer to be put under his tongue, (101 8,) *pulse* 98, good. Tongue dry in centre and for about ½ inch from the tip. Reported to have wandered and muttered last night, started up in bed once. Gave him a chloral draught, slept a little from 3 A. M. Is still partly under its influence. He did not look at the thermometer which he has done on all occasions up till to-day. Is weaker, passed water, and had a motion. Mist. cretæ occasionally. Eyes much suffused, pupils contracted. Face less congested, decubitus dorsal. 12 *noon—Temperature* 103·5, *pulse* 98. 1st sound of heart indistinct. Pulse weaker and tremulous. Is nearly in a state of stupor, but on being roused recognises people. Has had several watery evacuations; ordered tincture digitalis m xv every 4 hours; effects to be carefully watched; also an enema of

tincture opii m 50 in starch. To have 5 oz. brandy in the 24 hours. Hair to be cut close. 4-30 P. M.—*Pulse* 106, weaker and somewhat dicrotous, *temperature* 103·6°. Seems more stupid possibly from the opium in the enema, otherwise unchanged. *Respiration* 38, irregular and somewhat sighing. Eruption very profuse and thick. 7-30 P. M.—*Temperature* 103·8, *pulse* 40, character as before, *respirations* 38 perminute, accompanied by puffing of the cheeks. Decubitus dorsal, with sinking in the bed. Replies shortly but correctly to questions, mutters to himself; urine passed fairly well. Lungs quite healthy. No motion. 15*th*.—*Temperature* 101·5 (doubtful) *pulse* 116, *respiration* 32. Tongue browner. On right side there are patches of white. Is reported to have passed the night in a state of semi-consciousness. Took his food and medicine, respirations oppressed, chest and heart as before, the latter organ somewhat clearer. Is a little restless, abdomen still tympanitic. 12 *noon*.—*Pulse* 110, *temperature* 101·9, *respirations* 36. Had two stools, the first in bed but caused apparently by the sudden passage of wind. Breathing less puffy. Muscular twitching, ordered an enema with xx tincture opii. To have quinine sulphas, grs. x. Pulse more regular and less soft and compressible ; the result of the digitalis. *Left lung*, respiration coarse. Normal on percussion. Right lung lower third posteriorly dull on percussoin. Respiration feeble over this space and a doubtful crackling with inspiration and expiration. Also a little cooing with inspiration. A linseed poultice to be applied on the base of lung. Typhus spots very distinct, was not disturbed by a thunder storm, pupils slightly contracted, taking 15 minims digitalis every 4 hours. 4 P. M.—*Temperature* 102·5, *pulse* 110, *respiration* 36. No motion since last visit, lies in a semi-conscious state, and is with difficulty roused. Body twitching greatly, *i. e.* arm and side suddenly contract, seems very thirsty, drinks water very frequently, passes urine freely, Sp. Gr. 1036, strongly acid, high colored, no deposit : albumen traces. 7 P. M.—*Pulse* 108, *temperature* 101, *respiration* 42. Considers his case a very bad one. Is coherent when roused ; at other times lies in a state of stupor ; there is still a good deal of flatulence, heart's action more confused although the character of the pulse is good. Has just had a large watery stool. A few petechiæ are visible on the back. 16*th*.—*Temperature* 104·4, *pulse* 108, *respiration* 36. Is continually endeavouring to get out of bed, but is coherent when roused. Was very restless during the night. Great flatulence. Twitching less. Pupils not more contracted. Pulse more dicrotous, fairly non-compressible, breathing deeper, no urine passed since 8 P. M. last night, one small motion. Face congested, ordered for tympanitis. Spts. Terebinh m x in mucilage. To be fed every 2 hours but in minute quantity. 12 *noon*.—*Pulse* 112, *temperature* 102·5, *respiration* 38. Mind wanders and is much less coherent, urine passed fairly well. Left lung fairly healthy, a little hypostatic congestion posteriorly with coarse respiration. Right lung dull, posteriorly lower half on percussion. Loss of normal respiration, fine crackling below, moist above. Heart sounds clear though rapid. Has had several flatulent stools, in fact on every movement of the body in turning in bed his bowels are affected ; ordered 8 grs. plumbi acet. as an enema. 4 P. M.—*Pulse* 112, *respiration* 40, *temperature* 102·5. No stool since the enema, coughs occasionally, respiration shallow. Quinine sulph, grs. 10. Pulse very dicrotous, still taking digitalis mixture. 7-30 P. M.—*Pulse* 106, *respiration* 40, *temperature* 102·20. One very large motion has just been passed, to have another lead enema. Poultices are being kept continually applied to the right chest. General symptoms as before. 17*th* 7. A. M.—*Pulse* 108, *temperature* 102·6, *respiration* 36. Slept fairly well. Passed 2 stools in bed last night at 5. A. M., took altogether 15 grs. plumbi acet. since yesterday evening. Twitching of arms, though not so much as yesterday ; pulse dicrotous and getting weaker. Pupils not contracted. *Lungs*, left, coarse mucus rales on lateral and posterior surface. Heart's action still fairly clear. 12 *noon*.—*Temperature* 102, *pulse* 108, *respiration* 38. Tongue deeply white, furred, subsultus and twitching of hands and arms. Began meat juice at 10-30. A. M. every hour. Body sponged with vinegar and water, night shirt changed, and removed to an air bed. 1 P. M.—Had a large watery motion, dark brown. Pulse changed its character very quickly after the motion, it became small and weak, snoring inspiration, puffing expiration (not constant). 8 P. M.—*Temperature* 103, *pulse* 106, *respiration* 31. Pulse fairly full, but heart's action weaker at 5 P. M., had another watery motion. 18*th*, 1 A. M.—Has had another large watery dark brown motion, offensive, passed urine into urinal. Has been very quiet during the night, sleeping rather heavily, occasionally moaning and sometimes mutters a few words. Before the motion came he called for a drink ; while giving him some whisky and water the motion came with a rush. Urine slightly albuminous, specific gravity 1015. 8. A. M.—*Temperature* 102, *pulse* 104, *respiration* 34. From 3 to 5 had another motion. Mrs. Johnson says that from 5 to 8 he was very restless. Some sordes on lips. 10. A. M.—Another motion not large but more watery than before. Had his night shirt changed and was put on a clean bed, and had another smaller motion immediately. Blew his nose and said he had a power of hope and looked brighter. Very soon afterwards made vigorous efforts to sit up, subsultus and twitching seem less marked. 11 A. M.—A third watery motion, passed urine into urinal and afterwards fell asleep. 12-30 P. M.—*Temperature* 102, *pulse* 106, *respiration* 33. 3 P. M., urine 19 oz. Sp. Gr. 1015, traces of albumen. It is the first time he has passed urine without a motion for some days. 18*th* 8 P. M.—*Temperature* 103, *pulse* 108, *respiration* 36. About 10-30 P. M. breathing became oppressed. Dry rales heard over the chest, mustard poultice applied over the front of the chest, afterwards bran bags over the front and back, and the following mixture was given. Ol. Terebinth m x, spirits ether m xv, spirits chloroform m 20, oil juniper m xv, aqua, oz. 1. There has been much distress. 19*th May*.—Same great oppression of breathing, and increase of pulmonary complications. 20*th May*.—*Died*.

Note by Surgeon-Major R. Gray.

The case was treated by Surgeon-Major Bookey in consultation with Surgeon Grant. Both these medical officers had, before they came to India, seen epidemics of typhus fever,—the former in Ireland, the latter in Edinburgh. I saw Dr. Johnson first on the 17th May, which was the 11th day of illness. He was in a state of semi-stupor from which he could be roused by speaking sharply to him. The face was dusky and eyes injected. There were twitching of muscles and subsultus tendinum at times, also puffy expiration. The whole of the chest, abdomen and arms were covered with a dark brown macular eruption ; which had faded but had not entirely disappeared on the day of his death.

APPENDIX E.

POLICE FORCE.

No. I.—TABLE showing the SICKNESS and MORTALITY among the POLICE FORCE serving in the PUNJAB, during the year 1878 *and the prevalence of the princial diseases in each month of the year.*

Months.	Average strength.	Average number daily sick.	Number daily sick per cent. of strength.	Number of deaths.	Died per 1,000 of strength.	Causes of deaths in Hospital.																
						Small-pox.	Enteric fever.	Simple continued fever.	Intermittent and remittent fever.	Malignant cholera.	Phthisis pulmonalis.	Scurvy.	Apoplexy.	Heart diseases.	Respiratory diseases.	Dysentery.	Diarrhœa.	Hepatitis.	Wounds and accidents.	All other causes.	Died out of hospital.
January ...	19,607	217·89	1·11	24		...	...	...	1	...	...	...	...	...	11	1	1	...	...	1	9
February ...	19,634	193·49	0·98	17		...	...	...	...	...	1	...	1	...	3	...	...	...	...	1	11
March ...	19,616	193·84	0·99	23		...	1	...	3	...	2	...	...	...	5	...	2	...	...	1	8
April ...	19,635	212·85	1·08	18		...	1	1	...	...	3	...	...	...	2	1	1	...	...	2	8
May ...	19,627	210·07	1·07	20		...	...	...	2	...	1	...	...	...	3	...	...	...	...	...	14
June ...	19,557	247·64	1·27	19		...	...	...	1	...	2	...	...	...	2	...	...	...	1	...	11
July ...	19,593	246·72	1·26	17		...	...	...	2	...	1	...	1	...	1	...	1	1	...	2	8
August ...	19,583	349·85	1·79	22		...	1	...	3	...	...	...	...	...	1	...	2	...	...	1	13
September ...	19,614	499·95	2·55	26		...	...	...	2	...	...	...	...	...	1	3	2	...	...	2	16
October ...	19,631	679·36	3·46	44		...	...	1	6	...	...	...	...	1	6	5	6	...	...	1	18
November ...	19,496	586·61	3·01	70		...	...	3	8	...	...	...	...	...	19	3	3	...	...	4	30
December ...	19,447	419·01	2·15	62		...	...	...	4	...	1	...	...	...	14	8	1	...	...	6	28
						...	3	5	32	...	11	...	2	1	68	24	19	1	1	21	174
						Died per 1,000 of the average strength.																
For the year 1878	19,586	338·11	1·73	362	18·48	...	2·04			...	0·56	...	0·10	0·05	3·47	1·22	0·97	0·05	0·05	1·07	8·88
For the year 1877	19,610	237·37	1·21	249	12·70	...	1·12			...	0·36	...	0·15	0·05	2·55	0·31	0·31	0·05	0·15	0·76	6·88

Causes of Admission.	Number of admissions into Hospital in each month.												Total admission during the year.	Admitted per cent. of strength.	Died per cent. of admission.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
Small-pox	1	...	...	1	1	...	...	...	...	...	1	...	4	0·02	
Enteric fever	...	...	...	2	1	1	1	...	1	...	...	...	6		
Simple continued fever	1	...	2	9	10	37	36	26	28	11	11	...	171	34·24	0·60
Intermittent and remittent fever ...	182	129	163	196	245	326	278	567	1,576	1,575	930	363	6,530		
Malignant cholera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Rheumatism	23	14	33	29	22	12	14	14	14	12	13	28	228	1·16	
Primary Syphilis—															
Hard chancre (indurated bubo) ...	5	4	1	6	7	6	4	6	10	14	8	1	72	0·37	
Soft chancre (suppurating bubo) ...	7	10	9	10	4	9	9	17	6	13	13	12	119	0·61	
Secondary syphilis	2	2	1	4	2	4	5	4	1	3	6	2	36	0·18	
Phthisis pulmonalis	3	8	2	6	3	4	2	5	4	5	...	4	46	0·23	23·91
Scurvy	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...
Apoplexy	...	1	...	...	...	...	1	...	...	...	...	...	2	0·01	100·00
Eye diseases	4	7	8	13	32	18	20	20	17	11	10	6	166	0·85	...
Respiratory diseases	85	49	55	37	13	17	19	19	18	30	79	95	516	2·63	13·18
Dysentery	10	18	9	36	21	23	38	41	85	123	97	68	569	2·90	4·22
Diarrhœa ... —	4	3	13	10	9	6	16	8	24	15	21	9	138	0·70	13·77
Tænia	...	...	1	1	1	...	...	...	...	...	...	...	3	0·01	...
Hepatitis	1	...	1	2	1	2	1	1	...	1	...	...	10	0·05	10·00
Gonorrhœa	5	8	3	10	11	6	14	14	6	4	6	15	102	0·52	...
Guinea-worm	...	...	...	...	2	5	7	4	1	2	2	1	24	0·12	...
Abscess and ulcer	57	32	40	59	41	32	53	57	58	50	41	47	567	2·89	...
Wounds and accidents	14	7	16	19	12	12	13	8	7	7	12	12	139	0·71	0·72
All other causes	75	56	76	90	92	69	90	87	95	76	118	106	1,030	5·26	2·04
	479	348	433	540	530	589	621	898	1,951	1,952	1,368	770	10,479	53·50	
	Admitted per cent. of the average strength in each month.														
For the year 1878	2·44	1·77	2·21	2·75	2·70	3·01	3·17	4·58	9·95	9·94	7·02	3·96	53·50		
Ditto 1877	2·50	2·02	2·17	2·34	2·55	2·87	2·53	2·64	2·66	3·63	3·50	2·80	32·26		

No.—II. TABLE showing the SICKNESS and MORTALITY among the Police Force

Number.	Districts.	Average strength.	Number of admission.	Admission per cent. of strength.	Average number of daily sick.	Number daily sick per cent. of strength.	Number of deaths.	Died per 1,000 of strength.
1	Delhi ...	1,168	1,311	112·25	37·44	3·20	17	14·56
2	Gurgaon ...	515	191	37·09	4·97	0·96	9	17·47
3	Karnál ...	618	205	33·17	6·40	1·03	9	14·56
4	Hissar ...	547	230	42·05	7·68	1·40	10	1·83
5	Rohtak ...	456	235	51·53	11·22	2·46	8	17·54
6	Sirsa ...	383	219	57·18	6·73	1·76	4	10·44
7	Umballa ...	1,158	670	57·86	15·18	1·31	25	21·59
8	Ludhiána ...	552	441	79·89	20·48	3·71	10	18·11
9	Simla ...	210	60	28·57	2·38	1·13	1	4·76
10	Jullundur ...	521	251	48·18	8·33	1·59	15	28·79
11	Hoshiárpur ...	504	228	45·24	9·45	1·87	6	11·90
12	Kángra ...	417	141	33·81	0·38	0·09	7	16·79
13	Amritsar ...	934	671	71·84	17·39	1·86	24	25·69
14	Gurdáspur ...	582	206	35·39	7·01	1·20	15	25·77
15	Siálkot ...	544	133	24·45	6·85	1·26	5	9·19
16	Lahore ...	1,299	710	54·66	30·82	2·52	39	30·02
17	Gujránwála ...	507	198	39·05	8·43	1·66	6	11·83
18	Ferozepore ...	562	442	78·65	12·42	2·21	23	40·92
19	Rawalpindi ...	1,013	545	53·81	18·41	1·81	19	18·76
20	Jhelum ...	530	281	53·02	10·97	2·07	11	20·75
21	Gujrat ...	410	177	43·17	5·08	1·23	5	12·19
22	Shahpur ...	433	300	69·28	8·14	1·88	4	9·24
23	Mooltan ...	841	355	42·21	13·07	1·55	5	5·94
24	Jhang ...	507	124	24·46	4·13	0·81	3	5·92
25	Montgomery ...	482	254	52·70	6·66	1·38	5	10·37
26	Muzaffargarh ...	356	304	85·39	10·09	2·84	11	30·90
27	Dera Ismail Khan ...	595	308	51·76	8·48	1·42	11	18·58
28	Dera Gházi Khan ...	503	167	33·22	4·58	0·91	9	17·89
29	Bannu ...	459	231	50·33	3·91	0·85	3	6·53
30	Pesháwar ...	1,081	445	41·16	14·89	1·37	23	21·27
31	Hazára ...	478	138	28·87	7·28	1·52	8	16·74
32	Kohát ...	421	308	75·53	8·86	2·10	12	28·50
	Total ...	19,586	10,479	53·50	338·11	1·73	362	18·48

serving in each District of the PUNJAB during the year 1878.

Causes of deaths in Hospital.																
Small-pox.	Enteric fevers.	Simple continued fever.	Intermittent and remittent fevers.	Malignant cholera.	Phthisis pulmonalis.	Scurvy.	Apoplexy.	Heart disease.	Respiratory diseases.	Dysentery.	Diarrhœa.	Hepatitis.	Wounds and accidents.	All other causes.	Died out of hospital.	Number.
...	...	...	...	...	...	...	...	...	4	6	2	...	...	2	3	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	2
...	...	...	1	...	2	...	...	...	...	...	...	..	...	2	4	3
...	...	...	...	...	...	...	...	...	7	1	...	...	...	...	2	4
...	...	...	1	...	...	...	...	...	3	...	1	...	...	...	3	5
...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	2	6
...	...	...	4	...	2	...	1	...	...	3	...	...	...	1	14	7
...	...	...	3	...	...	...	...	...	1	1	...	...	...	...	5	8
...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	9
...	...	...	4	...	...	...	...	...	2	1	1	...	...	2	5	10
...	...	...	1	...	...	...	...	...	3	...	...	...	...	...	2	11
...	...	...	1	...	...	...	...	...	...	...	...	...	...	2	4	12
...	...	...	2	...	...	...	...	..	10	...	3	...	...	1	8	13
...	...	4	...	...	...	...	...	...	1	...	1	...	...	...	9	14
...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	3	15
...	1	...	1	...	1	...	...	...	17	1	3	...	...	2	13	16
...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	4	17
...	...	1	6	...	1	...	...	...	2	3	2	...	...	1	7	18
...	...	...	1	...	1	...	...	...	2	2	...	...	...	...	13	19
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4	21
...	...	...	1	...	...	...	...	1	...	...	1	...	...	1	...	22
...	...	...	1	...	...	...	...	...	1	1	1	...	...	1	...	23
...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	2	24
...	...	...	...	...	...	...	...	...	..	...	...	...	...	1	4	25
...	...	...	1	...	...	...	...	...	4	1	1	...	...	...	4	26
...	...	...	...	...	1	...	...	...	2	...	...	...	...	...	8	27
...	1	...	2	...	...	...	1	...	...	1	...	...	...	1	3	28
...	...	...	...	...	2	...	...	...	1	...	...	...	...	...	...	29
...	...	...	1	...	1	...	...	...	4	1	...	...	...	1	15	30
...	...	...	1	...	...	...	...	...	...	1	...	...	1	...	5	31
...	1	...	...	...	...	...	...	...	1	...	...	...	...	2	8	32
...	3	5	32	...	11	...	2	1	68	24	19	1	1	21	174	

REPORT

ON THE

SANITARY ADMINISTRATION

OF THE

PUNJAB

FOR THE YEAR 1878.

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