SELECTIONS

FROM THE

RECORDS OF THE

GOVERNMENT OF THE PUNJAB

AND ITS DEPENDENCIES.

New Series.

No. VI.

Sanitary Survey of Villages watered by the Western Jumna Canal.

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CONTENTS.

Letter No. 237, dated Delhi, the 19th August 1867, from Lieutenant Colonel W. McNeile, C. S. I., Officiating Commissioner and Superintendent Delhi Division, to T. H. Thornton, Esquire, Secretary to Government Punjab.

I have the honor to submit for the consideration of His Honor the Lieutenant Governor, copy of a letter No. 485, dated 13th ultimo, from Executive Engineer Western Jumna Canal, to Deputy Commissioner Dehli, and of the latter officer's No. 175, dated 8th instant to this office, suggesting that another sanitary survey, similar to that made twenty years ago, should be now made of the villages irrigated by the canal. I have not thought it necessary to forward the printed enclosures of the Executive Engineer's letter, as copies are doubtless available in your office.

2. The proposed survey could not I think fail to be of great value.

No. 485, dated 13th July 1867, from H. Garbett, Esquire, Executive Engineer Western Jumna Canal, Dehli Division, to D. Fitzpatrick, Esquire, Offg. Deputy Commissioner, Dehli.

I have the honor to forward for your perusal, copies of—

1*st*.—A report by the Medical Committee, ordered some 20 years ago by Government, to enquire into the sanitary state of the irrigated districts, dated 3rd March 1847.

2*nd*.—A memorandum by the Medical Officer, Surgeon Dempster, on malarious diseases, and the state of the country examined.

2. The Committee was ordered, as the country had suffered severely from epidemic fever, which was then generally attributed to the recent spread of irrigation in the North-Western Provinces. The results of the enquiry as disclosed by the tabular statements attached to the report, and by the map attached to Dr. Dempster's memorandum, are startling and important. They show that in many villages bordering on the Dehli Canal, the sufferers from spleen were as many as 75 per cent, and the average rate for the portion of the district examined was nearly 50 per cent. Well may these disclosures have led many to doubt whether the benefits conferred by irrigation were not out-weighed by the evils.

3. There is no doubt, that there is far less sickness now than at the time of the Committee's report. My reasons for believing so, are that—the examination was made shortly after an extraordinary epidemic; that experience has led to improvement in the management of water by Canal Officers: and I think, that the present generation, which has been born and

brought up on the borders of the Canal, may be less susceptible to the evil influences of malaria. Still, after making every allowance for improvement from these causes, there remain grounds for believing that the sanitary state of Canal villages is far from satisfactory; and this from causes which are to a great extent preventible.

4. The practical recommendations of the Committee were confined to suggestions—

1st.—To prevent the occurrence of these evils in the large tract that would be watered by the Ganges Canal, then under construction.

2nd.– To remedial measures for the improvement of the irrigated lands. The suggestions of the Committee with regard to the Ganges Canal were, I believe, carried out at a cost greatly in excess of the original estimate. Much has been done towards draining the lands irrigated by the Eastern and Western Jumna Canal; but, though attention was again drawn to the subject in the inquiries and long correspondence on the lands injured by swamp and reh; still almost nothing has as yet been done for the drainage and improvement of the villages on the Dehli Canal, which return so large a revenue, and form so large a portion of the agricultural community of your district.

5. Projects for improving the line of Canal, for an improved system of distributing the water, and for removing the obstructions to the natural course of the drainage, are in course of preparation; but time must elapse before they are matured, before they receive Government sanction, and before they can be carried into execution. In the meantime, would it not be as well to ascertain the actual state of things, and to try to effect improvement by enforcing a few simple sanitary rules? Much has been done by these means in large towns; but, nothing I am aware of, in the villages; and the state of dirt and filth which many of them are in, especially during the rainy season, is something indescribable.

6. I write therefore to ask if you consider the facts now brought to your notice are sufficient to warrant further enquiry into the present state of the country; and, if it would be possible to obtain the services of a Medical Officer for such an enquiry, at the end of the rains or the commencement of the cold weather.

7. The results of such an enquiry would, I conceive, be important to all interested in the welfare of the country. It would enable us to compare the present state with that of the past, and at some future time would afford the means of ascertaining the real value of the works, which will now soon be undertaken.

8. I would solicit the early return of the printed reports.

No. 175—337, *dated* 8*th August* 1867, *from D. Fitzpatrick, Esquire, Offg. Deputy Commissioner Dehli, to Lieut. Col. W. McNeile, C. S. I., Offg. Commissioner and Superintendent Dehli Division.*

I have the honor to submit herewith a copy of a letter, No. 485, dated 13th ultimo, from Mr. Garbett, Executive Engineer of the Western Jumna Canal here, on the subject of disease in villages along the Canal, arising from defects in its construction. I also submit, in original, the enclosures of Mr. Garbett's letter (reports drawn up on this subject in the year 1847-48), which I shall feel obliged by your returning when no longer required.

2. Mr. Garbett, you will observe, is of opinion that, owing to causes detailed in his letter, the sanitary state of the Canal villages, and the health of their inhabitants, are now far from being so bad as they were when these reports were drawn up; and as drainage and other works are about to be undertaken, which it is confidently expected will lead to a still greater improvement, he thinks it desirable that we should now, next cold weather, have a second sanitary survey, similar to that made in 1845-46, in order to ascertain and record the present state of things, and thus put ourselves in a position to judge hereafter of the effect of the works now about to be undertaken.

3. I agree with Mr. Garbett in thinking such a survey desirable; and with reference to para 6 of Mr. Garbett's letter, I may add, if it is not beyond my province to make such a suggestion, that Dr. Taylor, the present Officiating Civil Surgeon, who takes much interest in sanitation, will probably be relieved of his present duties by Dr. Penny's return during the next cold season, and thus become available for the survey, if Government determines on having it made.

No. 2263, *dated* 30*th August* 1867, *from Secretary to Government Punjab, to the Secretary to the Sanitary Commissioner Bengal.*

I am directed to forward for the opinion of the Sanitary Commissioner, copies of a letter and its enclosure from the Commissioner of the Delhi Division, No. 237, dated 19th instant, recommending a sanitary survey of the villages irrigated by the Western Jumna Canals, together with copy of a memo by Chief Engineer of Irrigation on the subject.

Note on Dr. Taylor's Report on the Western Jumna Canal, by Lieutenant Colonel H. W. Gulliver, R. E., *Officiating Chief Engineer Irrigation Works, Punjab.*

I have no doubt of the correctness of the general conclusions drawn by Dr. Adam Taylor as to the principal causes of the malarious diseases prevalent in the villages in the neighbourhood of the above canal.

2. I have not myself had any opportunity of seeing much of the country, except near Kurnal itself; but from plans which have come before me am fully aware to what a pernicious extent the drainage of the country has been obstructed by the canal and its rajbuhas.

3. If the plan accompanying Dr. Taylor's report be examined, it will be seen that the Rohtuck Branch runs parallel to one of the main lines of drainage of the country and crosses two others. The water-courses from the canal are carried across this drainage in embankment for the irrigation of lands on the further side, and so effectually have they closed it that in many places it can scarcely be traced, yet I am told there are traditions of villages being washed away by the water passing down this line. The two others crossed by the canal are closed by it, there is no provision for passing off the water.

4. The Wysur rajbuha and many water-courses also cross the two latter lines, so that it is hopeless to do any thing to the drainages until the irrigation is put into a proper shape.

5. The Hansi Branch again occupies the bed of another drainage line, the old Chittung nullah. But it must be remembered that this canal was originally constructed by a Native Government, and it must not be supposed that any such evils are likely to be caused on the canals now under construction.

6. I will make some remarks on the different portions of the canal alluded to by Dr. Taylor.

7. *Between Hathni Khoond and Indri.* It is proposed to increase the supply of water along this portion of the line and attend carefully to the drainage.

8. *Indri to Kurnal.*—The supply taken along this portion of the line will be reduced one-third, so that the level of the water will be very much lowered. The supply for the Hansi and Bootana Branches will be taken from Indri instead of Rer.

9. *Kurnal to Rer.*—The above remark applies equally to this portion. When it has been carried out, the swamps in the neighbourhood of Kurnal will be drained into the canal.

10. In addition to the Baoli drain mentioned by Dr. Taylor, an escape is excavated from Rer to the Jumna, into which a great many of the swamps on that bank of the canal will be drained.

11. The canal breaks into two branches at Rer—the Rohtuck and Dehli Branches. The water in the former will be reduced nearly three-fourths by the new line from Indri. The branch from Joshi to the Bootana and Hansi Canals will be abandoned, also the Bullah Branch and the head of the Bootana Branch.

12. *Joshi to Gohanna, thence to Rohtuck.*—The design and estimate for the thorough drainage of this line of country is ready, but cannot be put in hand usefully until the irrigation is remodelled, as the lines of the proposed channels are crossed and recrossed at present by embanked water-courses.

13. *Suffeedon.*—The new branch to feed the Hansi Canal will join the old Branch at this place. It is on the water-shed of the country.

Hansi and Hissar.—It is very seldom that sufficient water can be sent down this line to cause a flood, but the fact of it having occurred points to the necessity of an escape being constructed. There should be no difficulty, as the canal occupies the bed of the old Chittung nuddi.

Farm cultivation.—The Superintending Engineer has informed me, that the officer in charge of this establishment has largely increased the area cultivated.

14. *Dehli Branch.*—The drainage of the land in the fork between the Dehli and Rohtuck Branches, is included in the estimate mentioned above for that of the country near the Rohtuck Branch. What Dr. Taylor calls rajbuhas are merely village water-courses, but the former have also been carried across drainages in a most improper manner. All this will be rectified by the combined drainage and remodelling of irrigation it is proposed to carry out. All the land mentioned in para 73 is included in the above design.

15. *Jooah Swamp.*—The drain on one side of the canal is in progress; on the other is being estimated. The Kandrah drainage is finished; but these cannot work properly until the remodelling of the irrigation.

16. *General remarks.*—With thorough surface drainage, I do not think it will be necessary to have recourse to sub-soil drainage. At any rate I would make no attempt in the latter direction until the former has been fairly tried.

17. *Para* 87.—Dr. Taylor is perfectly right, that where a canal in any way interferes with the drainage of a country, such results may be expected as have been produced on the Western Jumna Canal, but I trust that such a method of construction is not likely to be repeated.

18. *Means of remedy.*—The fresh alignment of the canal altogether is scarcely practicable now that irrigation has been so thoroughly established along its course, but as I have explained above, the level of the water will be lowered. The drainage of the country must be fully provided for, but it is not possible nor advisable to keep the surface of the water always within soil :—

1*st*.—There are cases in which I believe damage would be actually caused by lowering it, *viz*., where the surface soil is hard and retentive; and by excavation, the water bearing or a porous strata would be reached, by means of which the spring level would be raised over a large extent of country.

2*nd*.—The reduction of all irrigation from flow to lift would impoverish the country, the cost of the latter being about fourteen times that of the former. As I have explained above, the drainage of the country is contemplated and designs for the purpose well advanced.

19. *Silting up Marshes*.—I consider this should not be attempted without the most careful calculation of the probable results, as in many cases where the marshes are the results of accumulation of drainage, the only effect would be the transfer of the swamp to some other situation. Drainage is the true remedy.

20. The planting of trees, seeing to villages and wells, and conservancy, can but to a small extent be controlled by the Canal Department.

21. *Summary*.

I.—Some alteration of canal lines and a general remodelling of the rajbuhas is proposed.

II.—Canal an d rajbuha water cannot be entirely kept below surface of the ground; nor is it needful to enforce this where drainage is attended to.

III.—Surface drainage must be attended to in the most thorough manner.

IV.—Sub-soil drainage will scarcely be required where the surface drainage is properly attended to.

V.—Zemindars must be prevented from bunding drainage lines.

VI.—Silting up old beds and jheels should be done with great caution.

VII.—Belts of trees should be planted round all villages, and conservancy of villages attended to. Although I have stated above, that the latter can only be partially attended to by the Canal Department, I am far from thinking that such should be the case; on the contrary, I believe that in a country irrigated by a canal, the whole sanitary condition of the tract should be looked after by the Canal Officers, closing or draining all offensive ditches and pools, enforced by them; but we have not now sufficient establishments for the purpose.

If no alteration should take place in the officers at present at my disposal, the following arrangements are proposed during next cold season for putting in hand the arrangements necessary.

Captain Brandreth—on the upper portion of the canal.

Captain Swinton—the Dehli and Rohtuck Branches.

Mr. Cotton—the new Hansi Branch.

Mr. Hanmer—Monsoon line towards Sirsa.

No. 611, *dated Simla,* 13*th September* 1867, *from the Secretary to the Sanitary Commissioner for Bengal, to the Secretary to the Government of the Punjab.*

With reference to your letter No. 2263, dated 30th ultimo, and its annexures, I am desired to state that, so far as can be gathered from these papers, there does not appear to be any sufficient reason for instituting a special survey of the canal villages referred to.

2. Mr. Garbett in his letter states that "there remain grounds for believing that the sanitary state of canal villages is far from satisfactory, and this from causes which are, to a great extent, preventible," but there is no evidence to shew that the people in these villages are suffering from disease to a greater extent than the general population of the district. It is very desirable, as Mr. Garbett suggests, in the 5th para. of his letter, that an effort should be made to effect improvement by enforcing a few simple sanitary rules, and measures to this end should be adopted without delay.

3. It is much to be questioned, however, whether any practical good would result from an enquiry into the condition of the people now, as compared with what it was when the Special Medical Committee examined them twenty years ago, or whether any reliable conclusions could be drawn from the result. The report of Committee which assembled in 1847 is not in this office, but it appears from Mr. Garbett's letter that, it assembled "after an extraordinary epidemic," and the results of a year of ordinary sickness could not fairly be compared with those in which disease had prevailed to an extraordinary degree.

4. The Sanitary Commissioner would therefore recommend that Major Crofton's suggestion should be carried out, and that when the improvements sanctioned have been in working for some years, an inspection of the localities should be made, in order to see whether irrigation properly carried out is really injurious to the health of the inhabitants.

5. Should any spare copies of the Reports of the Committee of 1847, and of Mr. Sherer's report, referred to by Major Crofton, be available, the Sanitary Commissioner will be glad to be favored with one of each of them.

From Secretary to Government, Punjab, to Secretary to Government of India, Foreign Department.—No. 388, dated 19th October 1867.

From Comr. Dehli, No. 237, dated 19th August 1867, with enclosures.
Memo. by Chief Engineer Irrigation Works, dated 28th idem.
To Secy. Sanitary Comr., No. 2263 dated 30th idem.
From ditto, No. 611 dated 13th September 1867.

I am directed to submit for the consideration and orders of the Supreme Government, copies of the documents marginally noted, relative to a proposal to depute a Medical Officer to make a sanitary survey of the villages irrigated by the Western Jumna Canal.

2. It will be seen that the Sanitary Commissioner is of opinion that there is no sufficient reason for instituting a special sanitary survey of the villages in question. But the Honorable the Lieutenant Governor desires me to remark, that from not having seen the reports either of the Committee of 1847 or Mr. Sherer, Major Malleson appears to be unaware how clearly those documents proved that a defective system of irrigation was, at the time those reports were written, the undoubted cause of sickness and mortality to a deplorable extent—or he would not have made the remark that "there is no evidence to show that the people in these (canal) villages are suffering from disease to a greater extent than the general population of the district"—or have implied "that enforcing a few simple sanitary rules and measures" is all that is required. And if the circumstance that the enquiries of the Committee were made immediately "after an extraordinary epidemic" was the real cause why the Committee found so lamentable a state of things to exist in the canal villages, this would not account for the further fact, which is mentioned by Colonel Crofton, and is undoubted, that Mr. Sherer, 9 years afterwards, found a state of things existing "very much worse than that described by the Committee of 1847."

3. On the other hand, if, as Colonel Crofton suggests—and His Honor has every reason to place confidence in Colonel Crofton's opinion—the partial improvement which is acknowledged to have since taken place is owing as much to "a succession of years of light rain-fall" as to the drainage and other works hitherto carried out by the canal authorities, or even more so; then His Honor is of opinion, that as the intended improvements have as yet been projected and carried out to but a very partial extent, it is of very great importance in the interests of sanitary science to ascertain, as far as may be found possible, during the present transition period the real state of matters connected with the health of canal villages at the present time, as compared with those at a distance; as well as the causes to which that state is attributed by the people, and is actually owing; so that we may then have to some extent a standard of comparison, both with the past and with the future.

4. It so happens that Dr. Adam Taylor, who is at present in medical charge of Dehli, and is a most competent person for this enquiry, will shortly be relieved, and is thus available for the duty; while the present time of year is precisely that most favorable for the purpose. It is proposed to allow him a salary of Rs. 650 P. M. (the salary of his rank for

medical charge of a 1st class station), with 8 annas a mile travelling allowance, and 5 Rs. per diem for halts, so that the entire cost will not exceed 5,000 Rs.; and His Honor ventures therefore to solicit sanction to depute Dr. Taylor for a period of 6 months, to enquire and report upon the present state of villages prejudicially affected by the Western Jumna Canal, and the causes to which their exceptional condition is really attributable.

No. 1860, *dated* 31*st October* 1867, *from Sir William Muir,* K. C. S. I., *Foreign Secretary for India, to the Secretary to Government of Punjab.*

I have the honor to acknowledge the receipt of your letter No. 388—2718, dated 19th instant, regarding the deputation of Dr. Taylor to make a sanitary survey of the villages irrigated by the Western Jumna Canal.

2. In reply I am directed to inform you that, under the circumstances represented, the Right Honorable the Governor General in Council has been pleased to sanction the deputation of Dr. Taylor for a period not exceeding 6 months, to enquire and report upon the present state of villages prejudicially affected by the Western Jumna Canal, and the causes to which their exceptional condition is really attributable.

3. Dr. Taylor while so employed will draw a salary of Rs. 650 a month, with travelling allowance at 8 annas a mile, and Rs. 5 a day for halts.

4. A copy of this correspondence will be communicated to the Public Works Department for consideration as regards the drainage works, &c.

Letter No. 4, *dated London,* 24*th February* 1868, *from Secretary of State for India, to His Excellency the Right Hon'ble the Governor General of India in Council.*

The despatch of your Excellency in Council, dated the 23rd December, No. 47 of 1867, reporting that you have sanctioned the deputation of Dr. Taylor to enquire into and report on the present state of the villages prejudicially affected by the Western Jumna Canal, has been considered by me in Council.

2*nd.*—In reply, I have to express my full approval of the arrangements reported in the despatch of your Excellency in Council, and I desire to be furnished with any report which Dr. Taylor may hereafter submit on the results of his enquiries.

From Adam Taylor, Esquire, Civil Surgeon Amritsar, to T. H. Thornton, Esquire, Secretary to Government, Punjab.

I have the honor to forward the report of my investigation of the sanitary condition of the villages irrigated by the Western Jumna Canal, made in accordance with letter No. 1860 of 31st October 1867, and forwarded to me with docket No. 3065 of 30th November 1867, from the Junior Secretary to Government Punjab.

Return divided into classes.

2. I have arranged the statistics which are the abstract of my examinations, in a series of returns, which I class under separate heads.

Class 1st includes irrigated villages.

3. The first class shows the amount of sickness in villages irrigated by the canal in its different divisions, *i. e.*, the divisions existing at the time of the commencement of my examinations, not according to the new distribution.

The class is sub-divided again into 2 sets showing the villages in close propinquity to (that is, within half a mile of) the canal, and those beyond that distance.

2nd class ; villages affected by obstruction to drainage.

4. The 2nd series shows groups affected by obstruction to the natural drainage of the country by the canal itself or its rajbuhahs.

3rd ; Nujjuffghur Jheel and Jumna Khadir villages.

5. The 3rd series shows the amount of sickness of the same nature as that observed in the irrigated villages found existing in the Nujjuffghur Jheel district and in the Khadir of the Jumna.

4th. The Bhanghir villages.

6. The 4th, the amount of the same disease existing in the Bhangir land of the Delhi, Rohtuck, Hissar and Kurnaul districts; this series shows observations taken for the sake of comparing the state of irrigated and unirrigated parts of country ; the 3rd series was partly taken for the same purpose, partly also to demonstrate the direct effect of even partial drainage in villages that had previously suffered from the malarious exhalations of neighbouring swamps.

Return of sickness furnished by Civil Surgeons of Kangra, Umballa, Jhelum and Jullundhur. 5th series.

7. In addition to these 4, there are returns furnished me by the Medical Officers of the Kangra, Umballa and Jhelum districts. The Civil Surgeon of Jullundhur sent me a return showing that no spleen disease existed in the villages he examined, there not being a single case detected ; and one other Civil Surgeon has sent me a return, but as he has omitted to head the form with the name of his district, and to mention the place of which he is Civil Surgeon, in his signature, (the name unfortunately being illegible,) I am unable to make use of his information, which has been carefully and with some trouble collected.

Map of districts inspected.

8. The map accompanying the report shows the situation of all or very near all of the places I visited. Under the names of the villages in red figures is written the amount of spleen disease detected in each. The boundary of the Khadir is shown, the sand ridges and the natural drainage of the country, with the direction in which it runs.

Diagram of level of disease.

9. A diagram giving in coloured lines the amount of fever in 1867, of disease of the spleen, and the level of springs in each district and group is annexed, for the purpose of showing at a glance the proportions of each in juxta-position, and the way in which these three circumstances affect one another. The amounts of fever and spleen disease run in lines almost parallel, while the height of spring level is generally in direct ratio to the culminating points of the lines of both diseases.

Disease produced by irrigation on the presence of an irrigating canal.

Their nature.

10. The diseases produced by a canal used for irrigation would be those resulting from an excess of moisture, whether that moisture be merely superfluous irrigation, whether water flowing over or percolating the banks of the canal, or whether it be an accumulation of rain-water from obstruction to the natural channel through which such water should have found its way into the great rivers and other main drains of the land. These diseases are known as those of a *malarial* nature, and as the most common are fevers of intermittent or remittent type, I have taken them and their effects as the criterion by which to judge of the salubrity or insalubrity of the localities I inspected.

Returns made after forms used by Dr. Dempster.

But give in addition the total area of land.

And a column showing per-centage of reh land.

11. The returns are made up so as to admit of comparison with those written in 1845, by a Committee composed of Major Baker, Doctor Dempster, and Lieutenant Yule; the difference being very slight, and consisting in the addition of 2 extra columns, one giving the entire area of the land of each village, that it may be contrasted with the area irrigated, the other showing the per-centage of land spoilt by the development of reh, or saline efflorescence on the surface, not mentioned in the report of 1845. The deteriorating influence of the action of the salts composing this matter had apparently not begun to operate at the time of the sitting of committee.

Spleen disease as a test.

12. The column in this return to which I beg to direct particular attention, is that giving the per-centage of persons having enlargement of the spleen. This disease was selected by Dr. Dempster as the indicator of the amount of malarial disease existing in the localities he visited; and as he was the first to deduce an opinion as to the sanitary condition of a place from the prevalence of this malady, it has become known as Doctor Dempster's

spleen test. It is admitted to be a correct one. Doctor Dempster in his report goes thoroughly into the matter, quoting extracts from authors of his day in support of his view.

Arguments in favour of its use.

13. It is not necessary for me to enter into a long explanation of the matter, as those who wish to enquire into it can find almost all to be said on this subject in the report of the committee already mentioned; but I may say, in case the opinions of medical writers of 23 years ago should be thought out of date, that the most modern authors on medicine support the same theory: Dr. Maclean, in *Reynold's System of medicine*, Dr. Aitken and Dr. Tanner, in works published during the last few years, may be cited as examples. I myself believe the test to possess nicety as well as accuracy; I adopted it when I commenced my enquiries, and the experience I obtained by the work I performed has quite assured me that I was correct in my choice. I found, it is true, in many villages that the results obtained were not precisely such as were anticipated, but I believe that when I was unable to account exactly for the immunity from, or prevalence of, splenic enlargement, it was not the test that was in fault, but my imperfect power of observation that led to the discrepancy; in most cases a careful examination showed that I had over-looked some important feature in the situation or condition of the villages, which accounted for the results at first unexpected. I invariably found that stagnant swamps, with reeds, vegetation in abundance, a spring level near the surface, extensive flooding by irrigation such as is used in rice cultivation, produced pallor of complexion, languor and depression of manner, stunted and shrivelled forms in the inhabitants of villages in their close proximity, that *there* also were the complaints of fever, most loud, and the per-centage of spleen disease, highest; moreover, these observations apply not only to irrigated districts, but to unirrigated.

Opinion of modern medical authors.

Examples of Bhangir land.

14. Take the latter first into consideration: the fact of the Kurnaul Bhangir being higher in its per-centage of disease than the Rohtuck or Delhi, is accounted for by the fact that the villages I saw in the first were low, surrounded by extensive jheel like tanks, uncultivated swamps, and scrub jungles, the spring level being somewhat higher than in the Delhi and much more so than in the Rohtuck or Hissar villages.

Examples of canal villages.

15. Of the irrigated villages I will specify two or three to illustrate a like connection: Balsee and Wysuree are 2 villages situated close together between the Delhi and Rohtuck canals, on a piece of land, the drainage of which is obstructed by a net work of rajbuhas and water-courses, the level of the water in the wells is very near the surface, their lands show much deterioration by reh, the aspect of the inhabitants was sickly to a degree, the children yellow, with the painfully grotesque appearance that a large, round, prominent abdomen with thin shrunken limbs, seemingly not able to support it, gives. The houses were in ruins, many of them; and the villages from their filthy neglected state showed the truth of the complaint, that the men had neither the strength

nor the spirit to repair damage, or preserve comfort. Here the spleen test gave the high No. of 67·5 per cent for Balsee and 77·5 for Wysuree. Take again Mahmudpoor near Gohanah, here 52 5 per cent shows an amount of malarial disease, the causes of which can be appreciated at a glance; a huge swamp filled with alligators and water fowl runs to the walls of the village, the water in the wells is not a foot below the surface, great complaints of sickness were made, and the truth of these complaints was written in characters legible enough on the sallow, anœmic appearance of the villagers and their children: steps are being taken to silt up the jheel alluded to, the plan is still in progress, and I think that the fact that adults showed more advanced as well as more frequent disease than children, is evidence that already a beneficial effect has been produced.

Examples of villages showing small per-centage of spleen disease.

16. Again, take the converse: for example, the villages on the Bootana branch of the canal; here a dry sandy soil, absence of jheels, distance from a canal not larger than a main water-course, little rice irrigation and deep wells, are attended with a small per-centage of spleen disease, robust and stalwart forms among the population, with cheerfulness and energy. The cattle are fat and clean, the houses neatly built and in repair, and evident are the signs of prosperity and contentment.

Other disease simulating spleen disease.

17. I am quite aware that an abdominal tumour of a different nature may sometimes simulate enlargement of the spleen, and that that organ may become of unusual size owing to disease of a nature other than malarial; but both these maladies are rare, so extremely rare that I do not think they would affect an average drawn as mine has been.

Possibility of attacks of fever without spleen disease.

18. Again, fever may recur several times without affecting this viscus, yet as where marsh miasm exists, I hold with Dr. Dempster there fever will be abundant and severe, according to the intensity of the poison; and as a consequence, spleen disease will prevail, if not in exact ratio at all events in a ratio sufficiently near exactitude to make the test as sure an one, as any index can be of a subject so difficult and complex. It is not pretended that all fever attacks as a natural consequence produce spleen, but some do, and it is fair to consider that the number doing so will be proportionate to the whole.

Difficulty in finding any other criterion.

19. Had it not been for "the test" I know not what criterion there was for me to take; the aspect of the people would be perhaps the physical sign best adapted for its substitute, but it would have been unsatisfactory, as it is an uncertain condition, influenced by causes of a temporary nature, such as dissipation or fatigue, as well as by others, which though permanent, as poverty, trade, caste, exposure to sun, &c., have no connection with the general health of the whole community; moreover, it is by no means so simple a matter as it looks, to determine within the limits of a short visit, the degree of robustness or health of a large number of people, and were

pains taken by different persons to arrive at conclusions on the point, these conclusions would be found very various.

Longevity.

20. Longevity among villagers would be (were it capable of being recorded, which it is not) a good test.

Amount of fever.

21. The amount of fever must be taken from the *statement* only of those examined ; now, though I believe that a very fair opinion as to the healthiness of the different places mentioned in my return, can be gathered from the figures in the columns showing number of adults having fever in 1865, 1866 and 1867, I have only been led to that belief by the singular way in which the amount of this form of sickness tallies with that of the other recorded. It would, if adopted as sole criterion, be open to many objections, such as that the natives from fear or misunderstanding, or from an idea that answers favorable or unfavorable would bring about certain results having an effect on their interests, would conceal or exaggerate the truth; in fact, these causes in many villages rendered this part of the investigation tedious and irritating to a degree. In some places I was evidently not believed when giving an explanation as to the cause of my enquiries, which though made in the most explicit way by myself and native attendants was discredited ; rumours, wild and absurd enough, but terrifying to the ignorant peasants, were spread about the census, which was going on at the time, and my work was believed to have some mysterious connexion with the dreadful object which induced Government to take so much trouble in instituting an enquiry so unusual, so prying, and so elaborate as the counting of the population. The abject terror of some men, great burly fellows, when called up to be examined was as provoking as it was ludicrous, in fact it often happened that the ridiculous appearance of an obese buneyah, quaking with alarm, and out of his wits with fear, by exciting the mirth of the others, rendered the prosecution of my examination a comparatively easy task. The lumberdars generally helped me by exposing the falsehoods of many who were concealing their sickness, but in some places fear of having their water-supply diminished, induced them to tutor their fellow villagers to answer my questions by denial; although however the evidence of each and every individual is, for the reasons stated above, more or less untrustworthy, I have full confidence in the accuracy of the deductions I have made from the general drift of the testimony thus collected, and the diagram which accompanies this report, showing as it does that the fever in 1867 so exactly corresponds with the per-centage of spleen disease, confirms me in this opinion.

The facility of detecting enlargement of the spleen.

22. Enlargement of the spleen is, contrary to all these organic disease of a viscus which is fortunately so placed as to render such enlargement detectable with certainty, and with extreme facility by the touch, it is hardly mistakeable, it cannot either be feigned or concealed; and as I have already stated, I believe it is a sound and delicate test of the degree in which Paludal miasm affects human life and health. I look on the returns compiled from observation

of its prevalence, as records of solid and substantial facts, not merely abstruse conjectures or theoretical conclusions. I apologize for the length of this discussion, but I thought it right to give clearly my reasons for taking the spleen test, and for my faith in it, as I have had arguments with professional men who doubted the soundness of my view in the matter.

Order of examination.

23. The investigations from the results of which the returns have been compiled, commenced in November 1867, and terminated in March 1868. They were so arranged that the effect of the seasons on health should not materially influence the *general* results obtained, or give one locality an advantage over another. I examined first of all in November the Khadir land in part, then some of the villages on the Delhi Canal, in December the Rohtuck Canal, the Rohtuck Bhangir land, and half of the Nujjuffghur Jheels, part of the Hissar Bhangir, and a few of the Hansi Canal villages. In January the rest of the Hansi Canal and Hissar Bhangir. In February a part of the Rohtuck Division, some more Dehli Canal villages, chiefly those on the obstructed drainage lines with the Delhi Bhangir and the rest of the Jumna Khadir. In March the Northern Division, the Kurnaul Bhangir, and the remaining villages on the Nujjuffghur Jheels. This plan spreads the examination of the different classes of districts fairly over the whole period.

Mode of examination of villages.

24. They were conducted in the following manner: on approaching a village I examined herdsmen, cultivators, and others in the fields and roads outside, I then sent one of these men or a servant ahead to tell the Lumberdars what I wanted, viz., the assemblage of 20 adults and the same number of children; I then, after having looked at the wells, &c., completed my examinations of the adults and children, being careful to take only those who were going to and fro about the place, or at work, rejecting all such as were brought up sick; in fact, I was as careful as I could be that the examinations should be free from anything likely to make their results fallacious, and that while they should show the absolute amount of sickness as correctly as possible, everything likely to render the average greater than the actual state of the case should be excluded.

Mode of examination of individuals.

25. The examination of the abdomen was made on subjects in a standing, or rather stooping position, the body being bent forward so as to relax the abdominal muscles as much as possible. This position, besides enabling me to feel for the enlarged spleens with quickness, and avoidance of all fuss, I found to be absolutely the one in which any tumour of that organ, situated as it is, could be most easily detected; children under one year of age, and men decrepid from senility were rejected; no case was recorded as one of enlarged spleen unless I was perfectly certain of the fact. It would have been much more convenient to have taken none but adults, but as it was desirable that the results of my enquiries should be compared with Doctor Dempster's tables, and as children seem to be more sensible to malaria than grown up people, 20 out of the 40, generally examined, were under 15 years of age. It was not always easy to make

up this number, a large one would have been impossible in small places. In towns and cities 80, 100, or 200, individuals were reported upon, the number being divided among the different mohullahs.

Castes of people examined.

26. The castes of the adults are noted, but the information therefrom derived is not of any worth; difference of occupation does not seem to increase or lessen the liability to disease which is produced by malaria inhaled by all out-door occupations, (exposing men as they do more than in-door to the influence of miasm) are at the same time healthy, from the free exercise that they enjoin.

Spring level.

27. The spring levels were some taken by myself from examination of the distance of the water in the wells from the surface of the ground, while others were given me by the Executive Engineer of the canal.

The area of irrigation.

Total area and reh area.

28. The amounts of irrigation were all furnished by the Canal Officers, the total area of land and the quantity of land affected by reh in the villages were sent to me from their offices by the Deputy Commissioners of districts.

Detail of sizes of spleen.

29. The letters at the heads of the columns detailing sizes of spleen are taken from Dr. Dempster's report. The explanation is as follows :—

"As the size to which the spleen attains is a very important feature of the disease, and most probably indicative of the intensity of the remote cause, I adopted a simple plan of noting 5 differences of degrees of size, which will at once be understood by reference to the annexed figure."

VL.—Very large spleen, passing across the medial line.
L.—A large spleen extending to, or nearly to, the navel.
M.—The mean of the 5 varieties.
O.—A distinctly marked case, smaller than M but larger than
S.—Small, but perfectly marked spleen.

This last term I gave to spleens which were only detectable by pressing in with the fingers under the ribs.

Other disease.

30. The only other forms of disease for which I looked especially, were Scurvy, Gurnea, Worm, Goitre, Leprosy, Epidemics, and sexual incapacity.

Scurvy.

31. The first (Scurvy) existed slightly along the whole tract of country that I visited. I could not gather sufficient data to suppose that it depended on other than dietetic causes; probably the absence of poverty and abundance of food, milk especially, prevented the appearance of the malarial form of this disease.

Guinea Worm.

32. Guinea Worm was only found to affect villages in the sandy tracts of the Rohtuck and Hissar districts.

Goitre.

33. Bronchocele was rare below Dadopoor, but above that level it was common enough.

Leprosy.

34. I could not trace any extra amount of leprosy; the malaria cachescia does not appear to have increased the number of victims to this dread malady in the canal country, though a connection between the two has been supposed.

Epidemic Cholera.

35. Cholera was, according to the accounts of the Lumberdars and Putwarees, light; most of the villages escaped altogether, only those suffering severely whose position placed them en route of the pilgrims returning from Hurdwar. I was surprised at this, as in the epidemic of 1862 I observed in the Rohtuck district, of which I was in medical charge at the time, that the mortality in the irrigated villages was greatly in excess of that in the unirrigated, my own observations on this matter being borne out by the mortality returns of the Police. I believe that some other cause than malaria may have produced this result; for instance, it was found in the epidemic of last year that natives, especially pilgrims or way-farers, threw bodies of people who had died of cholera into the canal, as a means of concealing the deaths from the authorities, as well as being an easy mode of getting rid of the corpse, without the trouble and expense of incremation or burial. The water of the canal would thus become tainted with matters containing the poison of the disease (which are most dangerous when in a decomposed state) and would convey it along its course, sowing seeds of the pestilence among all persons living by its banks or using the water for drinking or ablution.

The dirty careless habits of the people might also pollute the water in ways which it is not necessary here to particularize.

Epidemic Fever.

36. The yellow relapsing fever (whatever the proper name may be) that fever which has been so fatal of late years in the Punjab, and has excited so much attention in consequence of its having committed such havoc in the Jails, does not seem to have visited the canal districts during the last few years; and though legends exist here and there of a pestilence, having the features of this disease, carrying off people in great numbers some years ago, I could not detect any trace of its recent appearance save in Gugseena, a town in the Kurnaul district between that city and Rair, where the Lumberdars told me that a very severe fever accompanied by jaundice, delirium, and coma, had broken out and destroyed 22 people in a few days, that scarcely any one recovered from its attack, that it confined itself to a clump of 5 or 6 houses, which I visited and found to be brick havalies inhabited by

well-to-do Jats, with nothing peculiar about them beyond the usual want of ventilation and filthy court-yard, and not in a malarious or especially insalubrious locality.

Loss of sexual power.

37. Sexual incapacity, especially loss of virile power, was much complained of, and existed doubtless in people suffering from the debility occasioned by miasmatic poisoning and spleen disease; in Muhmoodpoor for example, the people, who were very querulous, stated that all the males were thus affected; natives would feel a matter of this sort most intensely, and their complaints on its score would be loud and exaggerated, so though I believe that in some cases this incapacity may really exist, it is not by any means as usual as is made out.

Barrenness of the women.

38. The common report was, that the women were not barren in the same proportion that the men were impotent, and in some villages the Jats complained of the number of widows thrown on their relations for support, owing to the fact that women suffered less from the unhealthiness produced by the canal than the men. I do not think that either of these statements would bear investigation, the Jat women working in the fields and undergoing very nearly the same amount of exposure as their husbands. Mr. Sherer, in his report states that the barrenness of the females rendered them ineligible as wives, and he was probably told exactly the contrary to myself, showing with what caution one must take any statements of natives regarding matters of health.

After the returns will be found appended remarks on each of the different districts mentioned in the forms, with a summary of the facts observed by me and the conclusions I have arrived at, with a humble suggestion of means to be adopted as curative of the sickness and damage detected. The paragraphs are numbered for convenience in continuation of those of my letters.

MATTERS AFFECTING SANITATION GENERALLY.

Points likely to modify sanitary condition independent of irrigation.

39. Before describing more in detail the actual effect of the Western Jumna Canal on the health of dwellers on the lands irrigated by it, it is as well to consider two points, which bear upon sanitation generally independent of irrigation, but which would modify the degree of health or disease.

Conservancy.

40. (*a.*) These are the state of the villages generally with reference to sanitary matters, such as ventilation, conservancy, &c.

General healthiness of the year.

(*b.*) The average general healthiness of the year and contemporary causes, generally affecting it, such as rain-fall, epidemics, &c.

Closures of the canal.

41. Then facts in the history of canal during the last 8 years must be mentioned; the only matter to which I think it necessary to allude being the closures of the canal, a statement of which is appended among the returns No. 25.

Height above the sea.

42. The height above the sea of the canal in different portions of its course.

General sanitary condition.

43. I have before mentioned that I found but little difference in the irrigated and non-irrigated country, except that which would naturally be the result of excessive moisture in the soil, and neglect of conservancy by people, rendered apathetic by debility and disease. The villages were generally situated on an elevation, slight at the outskirts, but rising to the centre in a more or less conical form. They were almost universally surrounded by ponds caused by water filling the holes left in excavating the earth used to build the houses. In bad villages these pools increased to jheels; that is, became extensive and evidently permanent, with slight diminution in the hot season, weedy, stagnant, and putrid in some cases.

Steeping flax.

44. Their putridity was most marked when I first began my inspection and was caused by steeping hemp. This practice is known to be extremely deleterious; any one possessed of the sense of smell could appreciate the force of the statements in *Dr. Aitken's Science and Practice of Medicine*, Vol. I, p. 926, that the vegetable decomposition caused by steeping flax has been so productive of disease, that in Italy, France, the Netherlands, and Spain, it is prohibited near towns.

Wells.

45. The wells of many of the villages were in a filthy state, they were often excavated in hollows, or in clayey ground in which the water spilt by the women and others cleaning their utensils and drawing water, lay and putrified, causing a stench that was unbearable; that this putrid fluid must percolate into the wells, and thus infect the water, was evident enough in many places. In addition to this cause, which affects wells in any locality, many in the irrigated districts were rendered useless (by the indirect effects of the irrigation), their water being quite brackish from the salts of Reh dissolved in it, or contaminated by percolation from jheels. I have been told that the effect of canal irrigation in the Barce Doab is invariably diametrically opposed to this: hundreds of wells which had been quite abandoned for drinking purposes, are now found to contain comparatively sweet water. I imagine that this is to be accounted for by the fact that in the Doab Reh is scarce in comparison. These are matters worthy of consideration, as it is now believed on pretty fair evidence that malarial fever and its sequelæ disease of the spleen may be caused either by inhalation of the paludal poison, in air contaminated, or by drinking water polluted by it.

Belts of trees.

46. The absence of protecting belts of trees is also worthy of notice. Scarcely any villages were so sheltered; in those which were fortunate enough to be so, the diminution of sickness was appreciable. The village of Jarouth is an example: situated in a bend of the canal which runs round it, with weedy swamps in close proximity having an appearance of the most marked insalubrity, it shows only 12·5 per cent of spleen disease. The soil here is light, but I attribute the comparative immunity from sickness to the absorption of the miasmatic exhalation from the canal banks and swamps by the foliage of the fine belt of trees intervening between them and the village.

Absence of ventilation.

Absence of conservancy.

47. Besides these features of the state of the country, those of the towns and villages most noteworthy are the following: the low huts, or close, ill-ventilated, havalies round a small court-yard, the ground of which acts as a sink for the liquid filth of the place; the narrow streets, with a black offensive drain running down their centres; the unwholesome habit of converting a portion of the dwelling into cowsheds and stables, whence the dung only is removed, the urine and liquid manure allowed to soak into and stagnate upon the uneven earthen floor; the inevitable village ditch, either half full of black stinking water, or a dryer but not less fœtid cloaca; the chumars' ground for cutting up the dead cattle; the ordure on the flat roofs of the houses; and all the other abominations of an Indian village, are to be observed in irrigated and non-irrigated towns alike, and though bad enough, they are present in all cases, and cannot therefore have any special influence on canal villages unless their ill effects may be heightened by the moist atmosphere of an irrigated country.

The year 1867.

48. The year 1867 was generally considered an unhealthy one, not only on account of the epidemic cholera brought in by the Hurdwar Pilgrims, with which we have little to do, but on account of the prevalence of malarial fever, which had existed after the rains all over the country in the Delhi, Rohtuck, Hissar, and Kurnaul districts. This was ascribed, and with reason, to the heavy rains; I have drawn out a statement (Return No. 24) showing the amount which fell during 1865, 1866 and 1867, at points from the beginning to the termination of the canal and its branches; and it shows that the fall was greatest in the year 1867 in all districts save that of Delhi, and where I cannot help thinking has been some error in the compilation of the return, for at that station I (who was there) certainly thought the rains very heavy indeed, and it was the general opinion; I have also shown the amount which was counted during each rainy season, taking the 4 months of June, July, August and September as constituting that period; this I have done, as it is the fall in the monsoon which causes malaria, not so much the showers which now and then occur with but little regularity during other months of the year. A glance at the statement will give an idea of the excess during the last year, and though this fact will partly account for the great preponderance of sickness in the groups of villages along the lines of obstructed drainage, the swamps caused by the holding up of the surplus water

being of course increased by the amount of the rain-fall in the year being larger than the average, I do not consider that this circumstance at all diminishes the value of the statistics; it was fortunate rather than otherwise, as I base my conclusions on comparison of the facts observed in the irrigated with those in the non-irrigated localities, both of which would be subjected to the effects of unusual rain to the same degree, were it not that causes exist which render them far more deleterious in the former than in the latter.

Closures of canal.

49. Return No. (25) is a statement showing the closures, with the number of days of each, of the canals during the years 1865 to 1867 inclusive. The only stoppage which is worth noting is that for 29 days in August and September 1867, which was made on account of the excessive rain, at that period, causing floods and doing away with the necessity of irrigation. This closure was imperative; and though, had the canal continued running, the flooding of the land would have been greater in consequence of extra supply, yet the amount of drainage obstructed by the banks of the canal and raised watercourses, was sufficient to swamp the country, and produce all the evils that would have resulted had the flood been caused by excessive irrigation. Many complaints though were made in some districts, where the rains did not happen to be severe, and where drainage was fair, of the ill effects on the crops of the deprivation of the usual amount of water.

Height above the sea.

50. The actual height above the sea of the undermentioned places is compiled from the reduced level given by the canal officers :—

Madulpore, ...	1,295	feet above	the sea.
Kurnaul, ...	808	do.	do.
Rair, ...	783	do.	do.
Joshi, ...	768	do.	do.
Gohana, ...	733	do.	do.
Rohtuck, ...	708	do.	do.
Hansi, ...	708	do.	do.
Hissar, ...	698	do.	do.
On the Delhi Canal.—Bulgong,	740	do.	do.
Key-stone of Lingeeree bridge,	713	do.	do.

IRRIGATED DISTRICTS.

51. I now propose to examine the conditions of the country through which the canal runs. For the sake of convenience I do this according to the Divisions of the canal, taking the Northern first, and commencing where it is run off from the river Jumna at the foot of the hills.

NORTHERN DIVISION.

Between Hathuie Khoond and Indri.

52. The first part of the canal between Hathuie Khoond and Dadapore does not seem to cause any great amount of sickness in the villages irrigated by or situated near it; here it runs down rather a steep incline, resembles, and in fact is, nothing more than a river with a rapid stream and pebbly bottom. The irrigation is but slight, the drainage of the country good, the water in the wells some distance below the surface, the soil sandy, and the surface of the water in the canal below that of the ground. Below Dadapore to Indri the canal remains at a low level, it runs in the Khadir of the Jumna, and the villages examined are on the edge of the Bhangir; they are affected by the exhalations of the low land beneath them, and the per-centage of sickness is higher than in the country above. Indri, Ghoodha, Santlee and Chapur show high per-centages of disease. A great deal of flooding takes place opposite Indri, from the zemindars blocking up the drainage to retain the water on the sugar and rice fields.

Indri to Kurnaul.

53. Between Indri and Kurnaul the amount of sickness is high; there are numerous jheels hereabouts, the country below the edge of the Bhangir being very wet, and the surface of water in the canal raised above the country. Efforts are being made to improve this part of the course of the canal, new channels being cut to reduce the height of the water by shortening the channel and avoiding loops; already 2,680 beegas of land have been reclaimed by fresh alignments and silting up of jheels, besides 1,578 beegas belonging to villages in the Kurnaul and Umballa districts. The surface level of the canal has been reduced by these measures as follows :—

1 mile below Dadapore,	75	feet.			
At Madulpore,	...	..	...	1·24	„
„ Dhamla,	...	..	..	0·81	foot.
„ Ranjnoon,	..	..	...	0·96	„
„ Radour,	..	..	..	0·67	„
„ Biddupore,	..	..	..	1·05	„
„ Indri,	..	..	..	2·07	„
„ Singowr,	..	..	..	2·18	„

54. The bed of the old canal (which it must be remembered was originally only a natural drainage channel, not an artificial water-course for irrigation), with its stagnant jheel-like pools filled with reeds and water plants, gives one an idea of great insalubrity; but when these plans of improvement are perfected (their results having only just begun to be felt), when the canal from Dadopore to Kurnaul runs in straight lines, and being below soil will act as a means of draining the country instead of being an obstruction to the escape of surplus water, when the marshes have become dry or have silted up, then the whole of this district will probably be as healthy as irrigated land (and the irrigation here is not likely to be much) can be. Reh has not damaged the soil to any great extent.

ROHTUCK DIVISION.

56. The next portion is the Rohtuck Division. I divide this as follows :—

1st	portion,	Kurnaul to Rei.
2nd	do.	Villages on the Boolie drain.
3rd	do.	Rer to Joshi.
4th	do.	Joshi to Rohtuck.
5th	do.	Joshi to Bootana.

The town of Kurnaul.

56. The unhealthiness of the town of Kurnaul has been proverbial for some time. In Major Baker's and Dr. Dempster's report it is mentioned often. In fact, the Committee of which they were members was assembled on account of the extreme sickness and mortality at that station. In their return 46 per cent. of the inhabitants are reported to have been suffering from enlargement of the spleen; and in my examination I discovered 41 per cent. The cause of this excessive sickness is the same now as it was then, viz., swamps existing between the town and the canal, which are caused by the obstruction to the drainage of the country by the high banks of the latter. That this opinion is not only mine but that of the civil authorities, I show by quoting an extract from a letter of the Deputy Commissioner of Kurnaul, in answer to one of mine on the subject.—"I should decidedly be of opinion that "the sickness was not caused in any degree by irrigation, but by the perma- "nent swamps in the vicinity of the town formed by obstruction in the drain- "age by the Western Jumna Canal being higher than the country in the "vicinity of the town. The Canal Department have for a long time contem- "plated to remedy this great and crying evil to the town and station of "Kurnaul, but I regret to say that up to this time practically nothing has "been done to remove the swamps. You would be conferring a great boon on "both the European and Native community of Kurnal by bringing this "circumstance to the notice of Government in your report."

From Kurnaul to Rer.

57. From Kurnaul to Rer all the villages show a great amount of sickness, with the exception of Gugseena, which was also healthy when examined by Dr. Dempster, containing then 11 per cent., now 5 per cent., of persons suffering from disease of the spleen. The spring level is lower than in the other villages, the soil is dry and sandy, (there is some appearance of Reh), and it is some distance from the canal. Almost all the other villages are unhealthy, Khowa Khera the most of all; there is a great contrast between this and Raipore, which is on the opposite bank: both are close to the canal, both low, but there is much more stagnant water about the former than the latter; Khowa Khera is a small poverty-stricken place, a mere assemblage of huts without trees, whose inhabitants drink the sweetish unwholesome water of their shallow wells, tainted with jheel percolation and brackish from the salts of Reh, while Raipore is a well-to-do large village, the inhabitants Jats, being well off, and apparently cheerful, no jungle or marshes, but 2 bad tanks near the place, with scanty trees, but insuffici-

ent as a screen, and wells so brackish that the people are absolutely forced to drink the water of the canal, to which circumstance and the fact that instead of swamps in proximity to the walls there is cultivation, do I ascribe the fact that 37 per cent only have enlarged spleen, while at Khowa Khera the number so affected reaches 70 per cent. The whole of the country about the canal, which here carries a great body of water and is high above the plain, is swampy; Reh is abundant, so much so that it is scraped up into large heaps and collected for the manufacture of bracelets of coarse glass.

Paneeput, Kabree, and Baolie villages on the Baolie Drain.

58. The town of Paneeput and villages of Kabree and Baolie, which latter is mentioned in the Delhi canal returns. Baolie, which is most conveniently described here, comes next in order. It is situated on a large maidan, which is so whitened with Reh as to represent the appearance that would be given by a thin covering of snow, in which there are several swamps and jheels; the per-centage of spleen disease, 45, is somewhat better than that mentioned in Dr. Dempster's return, 55;—probably owing to the new drainage. I quote a description given me of the Baolie drain by Mr. Hanna, the Executive Engineer.

"It is now about 15 years ago since a drainage channel was excavat-
"ed from Rer to the edge of the high land at Muhmoodpore, where it
"forms a junction with an ancient channel, which passes close to the town
"of Paneeput. This channel has been beneficial, in that it has tended to re-
"duce the swamps in the neighbourhood of the canal, but the additional
"drainage thus diverted towards the town of Paneeput has been supposed
"to have had an unfavourable influence on the health of the place; this
"however will be remedied so soon as the escape channel now being con-
"structed from Rer in a direct line to the Jumna shall have been completed."
Mr. Hanna also states, as a result I presume of this drain, that "during
"the last two or three years no increase has been noticed in the area of land
"affected by Reh." Kabree is situated on the line of this channel; the village, which is on a highish cone, is surrounded by swamps; it suffered recently from fever, and showed a per-centage of 30 of its inhabitants, subjects of splenic enlargement. The people, Goojurs, at first communicative, on a sudden became taciturn, and beyond this I was unable to get any information. They I believe have been complaining of the effects of the Baolie drain, but would say nothing of it to me. At Paneeput, on the contrary, the complaints were loud and long. The people (the jhumadar backed them) stated that fever had been very prevalent, that the water had risen in their wells from a depth of 80 to 20 feet, that it formerly was sweet, but now had become brackish and bitter, that their land was less fertile, and Reh was getting abundant, all of which ills they ascribed to the presence of the Baolie drain. I think that, though it is likely that some damage may have been caused, (especially if the drain in heavy rains overflows its banks) the complaints were much exaggerated; the amount of spleen, 33 per cent, was certainly high, especially for a town; and the aspect of the people was not robust, but the crops appeared luxuriant, and there was none of that langour and depression in the people, or ruin in the houses that is so marked in a bad canal village.

59. The canal divides at Rer, the smaller branch going to Delhi, the larger, which supplies Rohtuck, Hansi and Bootana Divisions, to Joshi before it again forks. It is in this portion that fresh alignments have mostly been cut, but they have not had any effect on the drainage of the country; in fact the swamps left by the old bed of the canal, which are extensive, weedy, and stagnant, increase the malaria, and render the amount of disease heavy:—Shera and Dhunngurh shewing, by the amount of disease in them at the present time, very nearly equalling that in 1845, that no appreciable benefit to health has arrived from the straightening of the course.

60. From Joshi to Gohana, which is on the Rohtuck branch of the canal (divided again at Joshi), there is a good deal of sickness, the worst place being Mahmoodpore, where there is a huge swamp now being silted up.

Obstructions to drainage.

61. There are several lines of natural drainage running in such a direction as to be obstructed by the canal and its water-courses in the Rohtuck Division; these are marked out on the map, the most important are —

1st —That which commencing by Bal Jatan runs between Balsee and Wysuree towards Uhur, where it is held up by the canal bank, Return No. 16.

2nd —That which begins at Badour, runs through Brahmin, Majra Karud, Joundur, Kulum and Khoord, to below Muhmoodpore.

3rd.—Is a line through the Sanghi estate. In fact on both sides of the canal the natural flow of the water is impeded by rajbuhas and raised water-courses, and though the accumulation is sometimes relieved by cutting through their banks, (a practice much objected to by the villagers) a great deal of difficulty is experienced in keeping the land from being flooded.

From Gohana to Rohtuck.

62. From Gohana to Rohtuck the sickness diminishes greatly, there are no swamps, the soil is sandy and porous, the canal bed small, there is no Reh, and the water in the wells is deep below the surface. The two Quhlours where only Dal or raised irrigation is used, and not much of that, are as healthy as Bhangir; one of the only two cases of spleen disease in the larger of the two was rejected as the subject had just come from Karnaul. Rohtuck itself I found remarkably free from illness, it is some distance from the canal and from irrigation, being beyond the influence of malaria from this source.

63. The Bootana Canal, which contains a small volume of water only, runs through a dry and sandy country, and though above the general level of the soil, as is shewn by the amount of Tor irrigation does not obstruct the drainage of the country. Dr. Dempster detected 16 per cent. of spleen disease, I only 4·6; the area of irrigation is however reduced.

HANSI DIVISION.

64. There is not much to be said of any special effects of the canal in this Division on the health of the population. There is no Reh, or at all events so little that it has not excited complaints ; the drainage is fair, and does not appear to be obstructed by the canal or rajbuhas ; the per-centage of sickness in the villages near the canal is 9 less than in Doctor Dempster's time, but that in more distant villages greater by 4. This increase is due to the effect on the average rate which my including the villages of Koomla, Mahda, and Rajpoora has had, as they were not examined by that officer. They were found by me to contain a great amount of sickness, which was accounted for by the jheel-like pools in their vicinity in Madha, caused as far as I could judge by the canal and water-courses.

65. It is worthy of remark that four large towns are situated in close proximity, in fact on the very banks of the canal in this Division, viz., Hissar, Hansi, Jheend and Suffeedun.

Suffeedun.

66. In Suffeedun there had been considerable sickness, fever had been very prevalent during and after the rains, but a very small per-centage (7·5) of spleen disease was found. Qunine had been freely distributed during the unhealthy period, the cases had been cured and spleen disease prevented.

Jheend.

67. In Jheend the average was greater, but the height of the town above the surrounding country, the care with which cleanliness and conservancy were enforced, kept it down to a comparatively low limit. In Dr. Dempster's report Jheend was in about the same state as I found it, Suffeedun more unhealthy, 29 per cent. of spleen disease existed ; this renders it still more likely that the present freedom from sickness in the latter is due to the curative action of Quinine.

68. At Hansi the amount is a little higher; 26 per cent in the town and 35 per cent. of the people in the "Nundee," were subject to enlargement of the spleen. The excess in the latter is easily accounted for, as its situation is low and damp, with some stagnant water about it, as well as a great deal of irrigation.

Hissar.

69. Examination of Hissar detected a great deal of sickness in the new town, as much as 55 per cent. and in the old town 27, making a total average of 49. The Bishnoe Bas was also inspected, as the Executive Engineer was anxious to ascertain its state, as its situation in the midst of irrigation and close to the canal appeared very unhealthy ; 70 per cent of the children had large spleens, (the place is not mentioned in the returns as only about 27 persons were found in it altogether). There had been in the station a

great deal of fever among the Europeans and their families, and many, especially the children, had big spleens. Although I had heard bad accounts, I was much astonished at finding *this* amount of disease, as when I was in medical charge of the place in 1863 I did not consider that it was unhealthy for a canal town. The officials and the native residents were all of opinion that sickness was of recent date, and ascribed it to increase of irrigation, and to the unhealthiness of the year, which was one of unusual rain. I wrote to the Deputy Commissioner and to the Civil Surgeon to ask their opinion on the matter, and I received a letter from Major Forster, extracts of which I quote.

70. "In my opinion the recent sickness is mainly attributable to "two causes, viz :—1st, excessive rain; and 2nd, the "abnormal condition of the canal, which has been "unusually full for some months past, and has only now subsided; lastly, "as regards the town of Hissar, I might add that the increased cultivation "and irrigation in the vicinity of the city and station, as well by the Cattle "Farm Authorities as by zemindars, have likewise to some extent had a "prejudicial effect. It is a well ascertained fact that the district of Hissar "keeps remarkably healthy when the rains have been scanty, as they generally "are in this tract of country, where as a rule droughts prevail, but whenever "after an interval of more or less length an exceptionable season occurs and "rain is abundant, it has invariably been the precursor of sickness. The "rain which fell during the past season was unusually copious for Hurrianah, "though comparatively with other parts of India not actually excessive, and "it has terminated in the usual result of extensive sickness. As regards "the second cause, the canal has of course been in existence for scores of "years, but in the memory of the oldest inhabitant, European or Native, it "has seldom if ever been so excessively full and flooded as within the past "few months; so long as the water is kept within proper bounds nothing "is to be apprehended, but when the channel overflows and inundates the "adjacent fields there is serious cause for alarm. It surely cannot be a "matter of surprise when low lands are swamped, and pools of water collect "in every hollow, with decayed vegetable and animal substances stagnating and "rotting in them under a hot sun, that fever should be prevalent.

Major Forster's letter.

"Referring to the last cause, the extent of farm cultivation at present "is I believe not so extensive as it used to be in former years when the stud "was in existence; but there is a decided tendency to extend it every year. "Doubtless such cultivation is very profitable to the creditor side of Farm "accounts, but that it is objectionable on sanitary grounds is the opinion "of the medical officers, in which I concur, and think it should be restricted "to certain defined limits, under the control of the Board of Health. I do "not wish it to be understood that I consider farm cultivation *alone* to be "prejudicial to health: canal cultivation by zemindars has also of late years "been gradually extending *within the limits of the station*, and such encroach-"ments require to be jealously guarded and watched with care; there is "nothing detrimental or obnoxious to health in mere cultivation, but when

" fields are manured with offensive refuse and dung, and drenched periodically " with water after the crops are sown, it then becomes pestiferous and a " nuisance."

Dr. Minas' opinion.

71. Dr. Minas in his answer states that sickness had been much on the increase: the mortality returns show that 12 deaths or 0·72 per cent. of the population in 1866, and 263 or 2·63 per cent. in 1867; the admissions from fever in the dispensary are 60·54 per cent. among the out-door patients, and 34·14 per cent. more than in the preceding year; the Jail and Police Hospital returns show a great increase, in the former 44·44 per cent., and the latter 76·27. All this Doctor Minas ascribes to malaria generated by the excessive irrigation, which is able to exercise its full effect on the town uninterrupted by the protecting influence of foliage, he stating that the cutting down of trees in the Bheer near the walls has been carried on to a mischievous extent. I do not quite understand why Hissar should be so much more unhealthy than Hansi, unless it be from this cause cited by Dr. Minas, viz. the absence of foliage as a screen, there being a great quantity of trees on the side of the town nearest the canal, whereas at Hansi the canal bank is covered with Sheeshum, Keekur, Figs and other large arboracious trees, which overhang it and the extensive tanks filled by its water, and which also shield the city from the malaria rising from the cultivation beyond.

DELHI DIVISION.

72. This branch of the canal leaves the main channel near Rer. Its course to Delhi is nearly due south at a distance of about 6 miles from the edge of the Khadir. At Rer it leaves the swamps and drainage in which the main line runs, and getting into higher ground the surface of the water is kept well below that of the country as far as Noulta. Attention is requested to Form No. 10, describing a very unhealthy group of villages contained in the fork formed by the early portions of Rohtuck and Delhi Canals. For the sake of convenience I have taken a triangle, the sides being formed by the two canals, as far as Joshi and Noulta respectively, with a straight line connecting these two places as a boundary to the space of land including the villages in this group. The whole country is a network of rajbuhas, which keep up the drainage to an extent damaging equally to the fertility of the soil and to the health of the inhabitants. The statement as to the amount of area of land spoilt by Reh was given me by the Deputy Commissioner of Kurnaul, but as far as I could see the whole plot of ground is more or less affected, and the villagers all complained that such was the case. No. 3 group of villages affected by obstruction to drainage. No. 16 Return shows places where in addition to the actual evils from circumstances above described, there is an especial cause of detriment, as shown in the map and remarks on the Form.

73. From Noulta the canal runs in a drainage which would naturally find its way down the hollow between the Delhi and Rohtuck branches

into the Bahadurghur portion of the Nujjuffghur Jheels. At Didwaree the canal is in the centre of this drainage, and continues so as far as a little below the Bullee bridge, the drainage of the swamps on the left bank being impeded by the canal embankment as well as by rajbuhas, (Jatoul, Bhumgoul, Dahur and Hustharee, owe their high rate of sickness to this cause,) while on the right side the drainage running away from the canal is blocked up by rajbuhas and water-courses above, *vide* group No. 1 of obstructed drainage return (No. 14); from a little below Bullee (the 22nd mile) to the 25th mile the line skirts a high sandy ridge, it soon after at Sitaolee, 29th-30th mile, cuts across the head of the Jooah swamp, damming up the drainage on the left, and rendering Sitaolee miserably unhealthy, it then bends round the ridge and skirts the Jooah swamp to the end of the 32nd mile.

From Jooah to Dehli.

74. From Jooah onwards the line gets worse and worse, the ground lower and more swampy, until it reaches the climax at the 38th mile, Batgong, (the 1st village on the Kandrah drainage) Attention here is requested to Returns Nos. 11, 12, 13, headed as describing villages in the Eastern and Western Jooah, and the Kandrah drains; these villages are all situated in swamps caused by natural hollows filled with surplus water from rain-falls and rice irrigation, having no outlet owing to the obstruction offered by the high water-courses. The Western Jooah and Kandrah drainage cuts meet at Hussunghur, and thence run in one channel to the Bahadurghur Jheel; they will be working probably during the next rainy season. I undertook these examinations and prepared the returns at the suggestion of the Superintending Engineer, not only to show the necessity for the cuttings, but that the amount of the present disease might be recorded, in case at a future time it might be wished to ascertain the effect of such cutting on the general health. The Eastern Jooah drainage is one for cutting through the sand ridge which with the canal loops up the country between the two, and letting the water that has no escape now off towards the Jumna. The state of the canal improves but little from Butgong to the 44th mile, but from Jerouthee to Chota Thanah, 3 miles beyond (47th mile), it is somewhat better; here, however, there is a large swamp that is undergoing the process of silting up, which however is not yet sufficiently advanced to show any great amount of increased healthiness. When the undertaking shall be completed, a large malarious marsh, of no use but to breed water fowl and harbour alligators, will become a valuable plot of arable ground. Below this to the 53rd mile, the canal is entangled in swamps cut up into ponds by the rajbuhas. Here are situated the villages named in No. 2 obstructed drainage group, No. 15 Return. The Bowanah escape is mentioned by Mr. Garbett as productive of damage to the villages in its course; it is an old nulla, and in heavy rains is insufficient to carry off the drainage of the country with the surplus canal water. The land through which it runs by Badlee and Alipore being swampy and full of jheels, further relief is needed. The Chota Khera Bridge is the centre of a new alignment, cutting off a large bend; a culvert has been laid under it and a drain dug, which affords relief to a large part of country

previously water-logged. The canal then crosses the valley through which runs the Nujjuffghur Jheel drain, passing over the latter by an old Mahomedan aqueduct.

75. The city of Delhi is very free from malarial disease, as will be seen by reference to the returns. There is very little irrigation close to it, but the Queen's gardens inside the walls are watered by the canal; the excellent state in which they are kept prevents any vegetable decomposition and consequent miasmatic exhalations. The Subzee Mundee gardens, though being much swamped and containing excessive not to say jungly vegetation, are productive of much local disease, the inhabitants whom I examined giving 20 per cent. of enlarged spleens.

Habit of damming up the drainage.

76. The evils produced in this district generally by the circumstances above mentioned are much enhanced by the habits the natives have of damming across the drainage, in order that they may improve their fields, and especially that they may grow more lucrative crops. Mr. Garbett pointed out to me that the residents of Pooghtulla built a dam which inflicts great injury on 4 villages, mentioned in No. 1 group of obstruct drainage, return No. 14; the water lying behind the bund stagnates and putrifies, breeding a large amount of disease.

Nujjuffghur Jheels.

77. *Nujjuffghur Jheels and Khadir.*—The effect produced on the health of the population of the villages of Nujjuffghur Jheels by the enlargement and improvement of the drainage cut to the Jumna in 1857 has been extraordinary. Comparing the results of the examinations in 1845 and 1867-68, we have only 5·37 per cent of splenic enlargement in the latter, and 43 per cent in the former; the average flood level is reduced 3 feet, and the aspect of the people is healthy and robust. They, though most anxious for more water for irrigation, speak of the great diminuition of sickness during the last few years, and all unhesitatingly ascribed it to the drainage. I inspected 10 villages at one end and 10 at the other of the Jheels, taking when possible those mentioned by Dr. Dempster. Now, it must be remembered that the Jooah and Kandrah drains will bring, judging from the large extent of country which they relieve, and its present marshy state, an enormous amount of additional water into the Bahadurghur Jheel, and care must be taken to keep the present out-let sufficiently large to meet the increased demand upon its capability; it may be necessary to enlarge it to prevent any diminution of the good effect it has already produced on the locality, to benefit which it was designed originally.

Khadir.

78. I attribute the bettering of the state of the Khadir villages to the increased cultivation in these parts. Disease of the spleen has decreased from 48 per cent to 12 per cent. I avoided unhealthy places in my examination of this district. The towns are all well kept, and the inhabitants wealthy from the fertility of the soil. Reh was apparent in patches here and there throughout.

BHANGUR LAND.

79. The Bhangur villages were examined to show the amount of sickness existing in them, in contrast to that exhibited by the irrigated country in close propinquity to themselves.

Those in the Kurnaul district were to a certain extent unhealthy : they were low in situation, on stiff and retentive soil, and many had nasty shallow weedy tanks or rather jheels about them, with a good deal of scrub jungle ; the aspect of the men was not so robust, and their manner was more depressed than that of the dwellers in Bhyranee lands in other districts, the Hissar Jats being the best specimens : these men kept their villages in nice order, and were it not that they retain the abominably filthy habit of using the same roof as covering to their dwellings and cattle sheds, they might be said to live in a state of almost cleanliness.

GENERAL SUMMARY.

80. I proceed now to recapitulate the effects of the Western Jumna Canal upon the sanitary condition of the villages whose lands it irrigates, or which by its proximity it influences ; and I take into consideration the damage that it inflicts by direct or indirect means, on vegetable life, on that of the lower animals, and lastly on human life, in order.

General effects of the Canal.

81. Two points are to be considered : one is the excess of vegetation in marshes and swamps, owing to the decay of which malaria is produced, and the other is the damage inflicted on vegetation by development of Reh as a result of excessive moisture.

On vegetable life.

82. The first point has been fully entered into above, is in reality the subject of this report, and needs not to be specially mentioned here.

83. The graphic description given by Mr. Sherer in his report on Reh is perfectly true, with regard to the worst districts ; in fact, the miserable state to which these have been reduced cannot be painted in too deep a colour. If matters are allowed (I speak thus from firm conviction) to go on without strenuous attempts at a permanent and radical relief, the country will become desolate from the barrenness of the soil, if not depopulated by disease. I allude only of course to the worst localities. I quote a passage from the above mentioned report by Mr. Sherer, again certifying that however improbable the statements may seem they are in substance not even exaggerated.

Selection from the Records of the Government of India in the Public Works Department, No. XLII.

" The miserable disease engendered by the tainted water and malarious " exhalations of the soil, affection of the spleen, is very prevalent, and whilst

" it produces in its victims a listlessness and lassitude in the ordinary occu-
" pations of life, it deprives them in many cases of the hope of a family, which
" as is well known is on religious grounds one of the most trying afflictions
" which the Hindoo has to bear.

" The unfruitfulness of women is a subject of common remark, and the
" consequent difficulty of inducing other Jat families to give their daughters
" to the men of Panipat, and the environs of the canals generally, is very great;
" and yet it is a most singular circumstance that nothing will persuade the
" villagers to drink canal water, which chemical analysis has shown to be
" quite free from noxious ingredients. The spectacle too of sick women and
" diseased children crouching among the ruins of their houses (for in many
" cases the rafters of houses have been sold), of haggard cultivators wading in
" the swamps, or watching their sickly crops, or attempting to pasture their
" bony cattle on the unwholesome grass, is present to his mind constantly."

84. I have in my return attempted to show the amount of Reh deterioration, but I regret that I could only get very scant information on the point; it is doubtless obtainable, but it was beyond my reach. Any lengthy description by me would be out of place here after the publication of the pamphlet I alluded to above; it will suffice for me to say that I believe that where saline matter exists in the soil, whether as supposed by some in a stratum at probably no great depth, or whether it is more or less diffused through the earth, there, if saturation is caused to such an extent that the level of the water is raised to within a few feet of the surface, will this efflorescence appear, a residue of the evaporation of water, holding salts in solution which is rising almost continuously to the surface. The only remedy to meet this evil appears to me to be *drainage*, not mere scratching the face of the land, but sub-soil drainage some feet deep, which will leave a certain amount of soil between its own level and that of the country in a condition to become comparatively dry, and will also by allowing the rain water, or the water of the irrigating canals, to run off, after having freed the soil by washing away a certain quantity of the soluble impurities, convert what are now causes of increased damage into aids to its own utility.

Amount of deterioration.

Drainage.

85. With regard to the utilization of land already damaged by Reh, it is impossible when the deterioration has reached a certain pitch: nothing will grow in it but Jâl (*Salvadora Indica*), a wood so poor and so full of salt that it is unsaleable even as fuel; it however absorbs such a quantity of saline matter (as is evinced by the ash it leaves after being burnt, and as may be easily detected by tasting its leaves) that it might if planted, and if care were taken by cutting and burning, that the earth did not again receive the matter once removed, assist in purifying the soil.

Utilization of Reh land.

Keekur will grow where crops will not, provided there be some moisture. The experiment has been tried with success. The plantations might be much increased with great benefit to the country generally. The people who look

Arboriculture.

only to quick returns will not be induced to plant trees, so that the matter must be carried out by Government. I often asked why attempts were not made to grow tobacco, plantains, and other produce, which would probably thrive where wheat would be but poor, but was always answered by " we are not gardeners but zemindars."

Effect on animal life.

86. The effect on animal life is probably chiefly a secondary one, produced by the quality of the forage; but nothing can be more wretched than the condition of the herds (with the exception of buffaloes, whose natural habit is swamp) : all are mangy, bony and small, (*i. e.*, in bad districts) of little use for draught or lading; they are just able to turn a small wheel to raise water, or drag for a short time the light plough through a thin layer of sandy soil.

87. This third and last topic, the subject in fact of the whole report, is shown chiefly in the returns. They prove, if any reliance is to be placed in them, that the presence of a canal and the irrigation therefrom produce disease, exactly in the proportion in which natural conditions of locality, soil, &c., prevent the land from getting rid of the excess of moisture which may be brought by that irrigation ; or the converse, that is, the degree in which the canal or its water-courses impede the natural drainage of the country, and thus prevent the land from ridding itself of the water brought on its surface, whether that be artificially as by irrigation, or naturally as by rain-fall.

Irrigation of itself innocuous.

88. I consider that irrigation of itself is perfectly innocuous, *i. e.*, when its effects are not in any way modified by circumstances which in themselves, whether they be natural or artificial, are more or less injurious to health; but that owing to the extreme frequency of their existence, irrigated villages generally evince a tendency to disease in excess to that shown by non-irrigated. My returns however furnish examples of all conditions. The villages in the Bootana and the last 4 on the Rohtuck Canal are as healthy as those on the Bhangur: these have good drainage, light sandy soil, no swamp, and the water in the wells is deep. From these any number of examples of all degrees of insalubrity may be found, up to such as Mahmoodpoor, Wysuree, Balsee, &c. &c., where swamp and saturation of the soil produce an amount of disease which is represented but in feeble colours by the formidable per-centages.

Faulty contruction of the Delhi Canal.

89. As it would be extremely difficult if not impossible to cut a canal so as to avoid all sources likely to be dangerous, irrigation must be expected even under favorable circumstances to be attended with a certain increase of sickness. The Delhi Canal unfortunately labours under many and great disadvantges : in the first place, its bed was chosen in direct opposition to all engineering maxims, being in the course of the drainage of the country, while the slope of the land being from the river Jumna, which runs in a direction nearly parallel to the canal, increases the evil ; then the earth contains a quantity of salts, which unfortunately irrigation tends to bring to the surface of the soil; the amount of sickness therefore detected by myself and the commit-

tee which formerly was appointed to report on the matter, cannot be taken as the invariable result of the presence of an irrigating canal.

Ill character of canal land not sufficient to cause decrease in its population.

90. Despite the ill fame which it possesses, for all the natives are aware of the sickness prevalent in irrigated districts, and in the Bhangir, Khadir and Jheel villages would direct me to the canal land to seek for disease of the spleen, and would state that almost all the cases that they had among themselves were contracted by people visiting relations in the latter, a statement confirmed by actual observation as well as by the evidence of others who had paid attention to the matter; I say, despite this ill report, the abundance of the means of life is greater in its power of increasing the number of the population, than the sickness has been in diminishing it.

Increase of population.

91. I have obtained through the kindness of the Deputy Commissioners of Rohtuck and Hissar the number of inhabitants counted (in all the villages I examined) in the two census taken in 1861 and 1868. The increase in the Bhyranee villages is 18 per cent, and in canal 40 per cent in Hissar, while in Rohtuck the former show 10 and the latter 20 per cent augmentation, nearly a proportionate difference. It would have been very much to the point if I could have ascertained the population to the square mile of the irrigated and of the non-irrigated lands, but the work involved in collecting the information was too much to ask from the District Officers, and I had no establishment. The satisfactory result above mentioned is caused by the abundance generally produced by irrigation, attracting wealthy immigrants, conjoined perhaps with the power of resistance to epidemic disease enjoyed by people in comfortable circumstances and above the depressing effects of poverty. It is impossible to believe that a population suffering to a considerable extent from a malady of a debilitating nature, having a depressing action on all vital functions, especially on that of reproduction, should possess prolific power in excess of that enjoyed by one abounding in health and vigour; however, be that as it may, the fact is quite sufficient proof of the utility of canal irrigation, and to show the utter folly of attempting to do away with it. The state of some tracts it is true are so bad that the population must be on the decrease: of these I unfortunately could not obtain the census returns, but they are but few, and the effort should be made to cure *their* ills without destroying the prosperity of others.

MEANS OF REMEDY.

92. And this leads me to discuss the means to be adopted to improve the condition of the people where it is deleteriously affected by the Western Jumna Canal.

93. Waving all idea of abolishing the canal as absurd, there are two grand and radical measures open, one being a fresh alignment, the other reducing the level of the surface of the canal below that of the country. The best plan would probably be such an one as would combine the two : there are extensive portions of the canal where it is already within soil, and others where improvements have straightened the course of the canal and diminished its obstruction to drainage ; the point however is not one for me to discuss, but for the engineers. I only have to state, what I believe to be the fact, that unless some such course be adopted, the sickness and damage to the land will reach a pitch *in certain places*, that will depopulate the country ; but I may be pardoned in stating what I believe to be the advantages of bringing the canal within soil, which are chiefly these, that no obstruction would be offered to the drainage by high banks of the canal or its water-courses ;—that the saturation of the soil by the percolation of water under pressure would be avoided ;—that excessive irrigation, as the water would have to be raised, would be prevented, surplus water might be drained away across the canal instead of dammed up as at present, and the extensive reedy jheels all along the side would be dried up. The plan would not entail the same expense as the making a fresh canal, which however might probably be so constructed as to do away with many of the evils dependent on the present one, and yet give the advantage to the revenue, and to the ryots, of Tor irrigation.

Alignment and reduction of level of canal to within soil.

94. Of palliative measures drainage comes first. This remedy will be necessary whatever may be done as regards the canal channel in Reh land ; and even if it be the only one adopted much good may be effected : culverts under rajbuhas will if large enough relieve some land, while in others broad and deep ditches will be required. Mr. Garbett has already commenced extensive drainage improvements in the portions of the canal which are alluded to above in his report under the heads of the Jooah and Kundrah drainage ; much remains to be done however, and even those mentioned are not yet in work. I have already alluded to subsoil drainage in para 84 above.

Drainage.

95. Marshes near the canal bank can be silted up in time, others at a distance are only to be done away with by drainage. Damming up drainage channels should be strictly prohibited, and villages so doing punished.

Silting up marshes.

96. Trees should be planted in as great abundance as possible. The advantages of foliage are well known : forest trees are always valuable and useful as purifiers of the air, but they are especially so as they have the power of screening localities from the ill effects of the marshes by their property of absorbing miasma.

Arboriculture.

97. Village ditches should be filled up if possible; they are hurtful when in saturated soil they become full of stagnant and putrid water, or when in dry situations they become receptacles of all kinds of filth and ordure.

Village ditches.

98. The wells should be looked after. Natives will not drink canal water, as in their ignorance they ascribe, naturally enough perhaps, the ills produced by a canal to its most prominent feature, the water it contains, and their ideas dont carry them beyond to the effect which it would produce directly as a beverage, and they in consequence prefer the water drawn from their shallow wells, polluted as it often is by percolation from marsh, or brackish from salt of Reh; however, one source of defilement might be avoided if chabutras were raised to a sufficient height to allow the earth round each to be sloped away and kept clean, and the water thrown down by the drawers not permitted to soak in the ground or collect in small pools, making the space around for some feet a black fœtid slough, the fluid of which must drip back again, through even a brick wall.

Wells.

99. As the attempt to produce anything like proper ventilation or conservancy in a native village is a task requiring power greater than that which enabled Hercules to clean the Augean stables, and wisdom deeper than that which produced the laws of Solon, I give up the idea of making any suggestion to cure, resting content on having noticed the evil; but I do think that a prohibition might be issued to the steeping of flax in proximity to human dwellings, where it is not only a source of danger to health but a disgusting nuisance.

Conservancy.

Flax steeping to be prevented.

100. I would propose that Quinine be issued to the districts much affected by fever, and that Civil Surgeons be authorized to make up some spleen medicine (pills of sulphate of iron and quinine would be most convenient) for distribution. I mentioned in my account of Suffeedun the good effects of quinine, and to show how grateful the people would be for the boon I often ascribed the ease with which I was able to make my inspections to the good will excited by my giving with tolerable liberality some simple medicines I provided for the purpose, to the sick; the demand however was often much greater than the supply which I could take with me, could satisfy. The distribution of quinine would be difficult, as Lumberdars if trusted with it would probably keep so valuable a drug for themselves or families, or if they gave it out would not make the favor a gratuitous one.

Quinine.

101. Lastly, I request to be permitted to direct attention to the rules which Dr. Dempster and Major Baker laid down for the control of irrigation, none of which I have discussed, as they are well known. I believe that they are attended to now. They should be most strictly enforced, especially

Dr. Dempster and Major Baker's rules.

that one which directs that no rice irrigation should be allowed near cantonments; other crops like sugar requiring a great amount of flooding should come under the same category.

Assistance rendered by Canal and other officers.

102. I beg to conclude by expressing my acknowledgements for the assistance rendered me by Major Merrick, who suggested several points to be noticed in my examination, and told me of localities requiring inspection, and who had the map drawn in his office principally; to Mr. Garbett, whose information was excessively useful to me, beginning a work of which I had no spealci knowledge, and who assisted me by information much of which I have copied into my report. Mr. Dupuis and Mr. Douglas and Mr. Hanna, all the canal officials in fact, did everything to render my work easy and my statistics correct. I have acknowledged the assistance of district officers in my report, and I have only to thank those Civil Medical Officers who have taken the trouble (no light one,) of sending me the results of examinations made in their districts.

Some figures wanting in the returns.

103. I have deemed it right after waiting a long while in vain for the information to send in my report wanting in one or two figures in the columns of the returns, thinking better that a few unimportant items should be omitted than that any further delay should take place.

ADAM TAYLOR,

Civil Surgeon,

Late on Sanitary Survey, Western Jumna Canal.

APPENDICES.

1st Series. **RETURN**

Abstract of Medical Examinations of twenty villages situated

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N	E.	N.	E.
1	Dhurrar, ...	14	6	...	...	..	...	14	...	2	...	2	1	1	...	19	1
2	Singowa, ...	14	6	...	...	...	...	15	1	2	1	...	1	...	...	17	3
3	Indri, ...	11	9	6	1	...	...	2	1	4	1	2	2	...	1	14	6
4	Goodha, ...	10	10	1	1	1	1	...	2	1	2	2	6	1	2	6	14
5	Sandlee, ...	14	6	...	1	8	3	...	1	...	...	1	2	3	1	12	8
6	Keerwan, ...	15	5	2	...	...	...	9	3	...	...	2	...	3	1	16	4
7	Zeinpore, ...	11	9	...	1	2	2	...	...	6	4	..	2	2	1	12	8
8	Chapura, ...	16	4	...	...	8	4	3	...	3	...	2	...	...	...	16	4
9	Moorad Nugger, ...	15	5	7	...	3	1	...	...	...	...	7	1	...	1	17	3
10	Bidderpore, ...	12	8	2	...	3	6	...	...	1	1	...	4	1	2	7	13
11	Ruddowa, ...	7	13	...	...	6	1	2	1	3	...	4	...	2	1	17	3
12	Kanjnoon, ...	13	7	1	...	9	7	...	...	...	...	2	...	...	1	12	8
13	Jobut, ...	13	7	3	...	10	2	...	...	...	...	4	...	...	...	17	3
14	Dowrung, ...	16	4	4	1	8	1	...	...	...	1	2	1	2	1	16	4
15	Dhamla, ...	13	7	...	...	1	...	6	1	4	1	3	3	1	...	15	5
16	Nourungabad, ...	19	1	...	...	1	...	10	...	...	...	2	2	3	2	16	2
17	Booria, ...	16	4	1	...	...	...	...	...	11	1	3	1	3	...	18	4
18	Deealgurh, ...	13	7	...	...	4	1	2	...	4	...	4	1	3	1	17	3
19	Dadoopore, ...	17	3	...	1	14	...	...	...	...	...	3	1	1	...	18	2
20	Behaudurpore, ...	18	2	...	...	13	...	1	...	...	...	1	1	4	...	19	1
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 1.

within half a mile of the Northern Branch of the Western Jumna Canal.

Per-centage of adults confessing to having had fever during the years			Per-centage of enlarged spleens.	Depth below the surface of spring level.	*Average annual amount of canal irrigation.*			Average annual amount of rice irrigation.	Total area of village land.	Per-centage of Reh land.	Detail of sizes of enlarged spleens.					
1865	1866.	1867.			Tar.	Daul.	Total.				V L.	L.	M	O.	S.	Total.
				Feet.	B.	B.	B.	B.								
50	35	30	17·5	15	28	26	54	25	3,632	...	...	...	2	3	2	7
50	10	40	22·5	30	382	109	491	189	4,766	...	...	...	5	3	1	9
60	50	70	37·5	4	147	49	196	146	1,630	...	...	...	6	5	4	15
65	70	60	60 0	12	No irrigation.			...	1,177	...	2	2	9	9	2	24
60	45	45	35 0	18	20	...	20	20	...	...	...	2	4	6	2	14
50	30	40	22 5	20	3	7	10	5	...	...	...	...	2	5	2	9
75	50	40	42·5	17	25	19	34	25	...	...	1	1	3	9	3	17
70	55	55	20·0	21	5	1	6	...	1,651	...	...	...	3	1	4	8
50	30	40	20 0	20	4	2	6	...	...	...	...	...	1	4	3	8
90	50	60	52·5	30	9	4	13	9	...	...	...	3	6	8	4	21
25	35	70	40·0	30	46	27	83	36	...	...	...	1	1	6	8	16
40	45	65	37·5	20	9	3	12	6	...	...	2	1	4	1	7	15
35	50	60	25 0	30	4	1	5	4	...	...	...	...	4	1	5	10
30	25	55	20·0	30	9	1	10	10	...	...	...	...	1	5	2	8
55	35	60	30·0	15	37	34	71	54	...	...	...	1	2	4	5	12
20	10	40	12·5	40	2	12	14	11	...	...	...	...	...	4	1	5
40	25	40	15·0	35	7	6	3	9	...	...	...	...	...	6	...	6
10	20	45	25·0	40	4	2	6	4	...	...	...	...	...	5	5	10
15	...	40	12·5	15	No irrigation.			...	...	...	...	...	2	2	1	5
20	15	20	7·5	40	180	13	193	82	...	...	...	...	1	...	2	3
45·5	34·25	48·75	27·75	24·1												

1st Series. **RETURN**

Abstract of Medical Examinations of eight villages situated at a distance of

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
1	Beebeepore,	10	10	3	1	4	2	...	...	...	1	2	7	...	...	9	11
2	Bunnee,	8	12	4	2	4	3	1	...	...	...	5	...	...	1	14	6
3	Chullundee,	10	10	1	2	7	4	...	...	...	...	1	1	3	1	12	8
4	Moonda Majra,	15	5	1	...	...	...	10	2	...	...	3	1	3	...	17	3
5	Kurwun,	18	2	...	...	2	1	8	...	...	1	5	1	2	...	17	3
6	Goolabgurh,	15	5	2	...	8	...	1	...	...	...	2	...	6	1	19	1
7	Choorpore,	18	2	3	...	13	1	...	...	...	...	1	...	2	...	19	1
8	Kiderabad,	20	...	1	...	6	...	...	...	2	...	10	...	1	...	20	...
	Total average,																

No. 2.

more than half a mile from the Northern Branch of the Western Jumna Canal.

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Annual average amount of canal irrigation.			Average annual amount of irrigated Rice.	Total area of village land.	Per-centage of Rich land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.				V.L.	L.	M.	O.	S.	Total.
1865.	1866.	1867.		Feet.	B.	B.	B.	B.								
55	65	75	52·5	4	89	28	117	89	3,271	...	1	1	8	6	5	21
20	10	55	45·0	20	19	11	40	24	...	...	...	1	6	7	4	18
55	35	50	45·0	6	8	2	10	9	...	...	...	1	6	5	6	18
20	30	30	20·0	34	28	6	34	26	...	...	...	1	1	2	4	8
20	20	15	12·5	30	No	Irri	gation.	...	...	...	...	...	1	2	2	5
35	35	50	15·0	15	87	9	96	55	...	...	...	...	...	2	4	6
15	15	40	7·5	15	528	129	667	352	...	...	...	...	...	1	2	3
20	10	35	...	40	972	120	1,092	462	...	...	...	...	...	...	...	...
30	27·5	43·75	24·68	20·5												

1st Series. **RETURN**

Abstract of Medical Examination of seventeen irrigating villages situated

	Villages.	Children of all classes.		Adu					
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.	
		N.	E.	N.	E.	N.	E.	N.	E.
1	Kurnaul, ...	45	35	6	1	21	14	...	...
2	Phoosluck, ...	11	9	...	...	10	3	...	...
3	Raipore, ...	10	10	...	...	10	2	...	...
4	Khowa Khera, ...	4	16	2	...	6	9	...	...
5	Shera, ...	9	11	...	2	7	7	...	...
6	Dhurmgurh, ...	10	10	...	1	7	4	...	1
7	Jashi, ...	9	11	1	...	11	4	...	...
8	Baroudh, ...	9	11	3	1	1	...	8	5
9	Whur, ...	15	5	1	...	13	...	...	1
10	Korana, ...	14	6	1	2	9	3	...	...
11	Sumanka, ...	8	12	...	...	13	2	...	...
12	Mahmoodpore, ...	10	10	...	1	6	4	...	...
13	Gahana, ...	14	6	1	...	...	...	9	3
14	Mohran, ...	17	3	...	...	12	...	...	...
15	Bhynswal, ...	13	7	...	...	13	...	...	...
16	Chichrana, ...	13	7	1	...	11	1	...	...
17	Singpoora, ...	18	2	...	...	14	1	...	...
	Total average, ...	...	...	...	...	...	...	...	...

No. 3.

within half a mile of the Rohtuck Branch of the Western Jumna Canal.

L T S.										
Bunyahs.		Artisans.		Menials.		Total.		Per-centage of adults suffering from fever in the years		
N.	E.	N.	E.	N.	E.	N.	E.	1865.	1866.	1867.
8	2	12	10	2	4	49	31	25	30	64
...	2	3	2	...	...	13	7	30	35	45
...	...	4	3	1	...	15	5	25	25	50
...	1	...	...	...	2	8	12	40	45	60
1	...	...	1	...	2	8	12	15	25	75
1	1	...	5	...	...	8	12	55	60	70
1	1	...	...	2	...	15	5	30	20	45
...	...	...	...	1	1	13	7	50	55	65
2	...	2	...	1	...	19	1	5	25	25
2	1	2	...	...	...	14	6	60	30	35
1	...	2	1	1	...	17	3	50	45	70
1	2	2	4	...	...	9	11	60	66	100
5	...	2	...	...	...	17	3	60	30	70
4	1	3	...	...	...	19	1	35	10	25
2	1	1	1	1	1	17	3	35	...	45
3	...	2	...	2	...	19	1	20	45	45
2	...	3	...	...	...	19	1	10	30	35
...	...	...	...	...	...	...	...	35·58	33·88	54·35

RETURN

	Villages.		Per-centage of enlarged spleens.	Detail of spring level.	Average annual irrigation.		
					Tar.	Daul.	Total.
				Feet.	B.	B.	B.
1	Kurnaul,	...	41·25	...	3,864	27	3,391
2	Phoosluck,	...	40·0	8	618	247	865
3	Raipore,	...	37·5	6	359	53	417
4	Khowa Khera,	...	70·0	8	217	22	239
5	Shera,	...	57·5	6	1,054	29	1,033
6	Dhurmgurh,	...	55·0	6	841	85	926
7	Jashi,	...	40·0	...	323	36	359
8	Baroudh,	...	45·0	95	136	457	593
9	Whur,	...	15·0	7	442	59	501
10	Korana,	...	30·0	8	3,078	9	3,087
11	Sumanka,	...	37·5	4	520	...	520
12	Mahmoodpore,	...	52·5	1	2,739	...	2,739
13	Gahana,	...	22·5	15	1,521	47	1,568
14	Mohran,	...	10·0	10	699	58	757
15	Bhynswal,	...	25·0	5	847	4	851
16	Chichrana,	...	20·0	7	951	1	952
17	Singpoora,	...	7·5	30	152	6	158
	Total average,	...	36·67	12·70	...	...	...

No. 3.—(*Concluded.*)

Average annual rice irrigation.	Total area of village land.	Per-centage of Reh land.	Detail of sizes of enlarged spleens.					
B.			V. L.	L.	M.	O.	S,	Total.
3,798	18,416	8	...	5	24	30	7	66
584	2,997	8	1	1	6	7	1	16
307	1,704	...	...	...	5	7	3	15
190	1,702	7	...	1	9	10	8	28
1,099	4,136	32	...	1	15	6	1	23
786	3,377	7	1	1	11	8	1	22
150	2,345	...	...	2	6	5	3	16
10	...	...	...	1	11	4	7	18
484	5,892	...	...	...	2	3	2	6
423	10,047	...	...	...	4	7	1	12
198	...	...	...	...	6	8	1	15
709	6,332·7	270	...	3	9	7	2	21
687	10,765·18	60	...	...	2	6	1	9
90	27,089 10	...	...	...	...	3	1	4
132	3,059 8	50	...	...	3	3	4	10
63	4,587 5	30	...	...	3	3	2	8
4	3,501·2	...	...	1	1	1	...	3
...	...	...	...	...	...	...	...	...

1st Series **RETURN**

Abstract of Medical Examination of eighteen irrigating villages distant

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
1	Sitoundee, ...	10	10	1	...	9	4	...	...	...	1	3	1	...	1	13	7
2	Gugseena, ...	19	1	...	...	14	1	...	...	3	...	2	...	...	...	19	1
3	Moonuck, ...	14	6	...	...	2	1	9	2	3	...	1	1	...	1	16	4
4	Rer, ...	10	10	...	1	...	1	7	4	1	1	2	3	...	...	10	10
5	Didlana, ...	12	8	1	1	1	1	5	5	2	1	2	1	...	...	11	9
6	Begumpore, ...	5	15	...	...	9	4	...	...	...	2	2	2	1	...	12	8
7	Kalree, ...	9	11	1	...	6	1	...	...	1	...	1	...	3	...	19	1
8	Paniput, ...	26	16	3	...	...	...	9	5	3	3	7	2	7	1	29	11
9	Mudlounda, ...	15	5	2	...	10	2	2	...	...	...	1	...	3	...	18	2
10	Balsee, ...	4	16	...	...	5	4	...	...	...	...	2	1	4	4	11	9
11	Wysuree, ...	2	18	1	1	2	5	...	...	...	5	2	2	2	...	7	13
12	Laharee, ...	16	4	2	...	9	1	...	...	2	4	...	2	...	...	13	7
13	Matun, ...	13	7	1	...	10	2	...	...	4	...	3	...	...	...	18	2
14	Burra Guhlour,	19	1	...	...	15	...	...	...	3	...	2	...	...	...	20	...
15	Chota Guhlour,	18	2	...	...	17	1	...	...	...	...	...	...	2		19	1
16	Sanghee, ...	20	...	3	...	12	1	...	...	1	...	...	...	3	...	19	1
17	Chumrara, ...	19	1	2	...	11	...	...	...	1	1	3	...	2	...	19	1
18	Rohtuck, ...	20	...	2	...	6	...	1	...	5	1	4	...	1	...	19	1
	Total average,...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 4.

half a mile or more from the Western Jumna Canal in the Rohtuck Division.

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Detail of spring level.	Average annual irrigation.			Average annual rice irrigation.	Area of village land.	Per-centage of Reh land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.									
1865.	1866.	1867.		Feet	B.	B.	B.	B.			V.L.	L.	M.	O.	S.	Total.
25	40	40	42·5	15	368	488	856	302	3,838	...	1	3	8	3	2	17
10	10	20	5·0	20	1,031	726	1,751	523	8,980	...	...	...	...	2	...	2
20	25	35	25·0	20	1,505	335	1,840	1,598	9,854	...	...	...	4	5	1	10
50	50	75	50·0	10	1,030	157	1,187	1,258	...	...	2	...	10	7	1	20
10	45	55	42·5	6	593	20	613	463	3,166	11	...	2	7	7	1	17
6	55	80	57·5	6	467	11	478	460	1,142	40	...	2	9	9	3	23
30	30	60	30·0	9	1,070	29	1,099	242	...	...	...	1	2	5	4	12
70	80	75	33·5	2	2,821	359	3,180	344	...	...	1	...	5	13	8	27
30	45	30	17·5	...	1,253	49	1,302	113	...	...	...	...	1	3	3	7
65	65	70	62·5	4	723	209	932	515	1,691	...	...	4	9	9	3	25
60	60	95	77·5	12	1,810	780	2,590	1,622	...	...	...	1	14	6	10	31
20	45	75	27·5	10	10	1	11	3	4,194	...	1	...	4	3	3	11
15	40	70	22·5	20	861	2	863	191	2,362	...	...	...	3	5	1	9
20	5	10	2·5	20	...	378	378	12	2,808	·01	...	...	...	...	1	1
20	15	25	7·5	20	...	365	365	23	1,200	·01	...	...	...	1	2	3
25	30	15	2·5	8	1,869	5	1,874	129	9,395	...	...	...	...	1	...	1
20	25	40	5·0	58	769	1	770	99	2,190	...	...	...	1	...	1	2
...	10	15	2·5	33	554	3	557	38	12,497	...	...	...	...	1	...	1
27·55	37·5	49·10	28·52	13·9												

1st Series. **RETURN**

Abstract of Medical Examination of seven irrigating villages distant more

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
1	Chota Oorlana,	16	4	...	1	...	...	9	1	2	...	2	...	5	...	...	20
2	Burra Oorlana,	20	...	1	...	...	1	11	...	3	...	2	...	2	...	19	1
3	Seenk, ...	20	...	...	...	13	1	...	...	3	...	3	...	...	...	19	1
4	Burra Anchera,	17	3	...	...	13	1	...	...	3	...	3	...	...	...	19	1
5	Gungana,	20	...	2	...	12	...	...	...	2	1	3	...	...	...	19	1
6	Bootana, ...	20	...	3	...	10	...	...	...	4	...	3	...	...	...	20	...
7	Barouda,	20	...	1	...	11	...	...	...	4	...	2	...	2	...	20	...
	Total average,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 5.

than half a mile from the Bootana Branch of the Western Jumna Canal.

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Average annual irrigation.			Average annual Rice irrigation.	Total area of village land.	Per-centage of Reh land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.				V.L.	L.	M.	O.	S.	Total.
1865.	1866.	1867.		Feet.	B.	B.	B.	B.								
30	50	40	15·0	50	422	50	472	182	4,161	...	...	...	3	2	1	6
20	10	40	2·5	50	180	89	269	488	10,419	...	...	...	1	...	...	1
40	25	15	2·5	35	1,055	50	1,105	301	7,263	...	...	...	1	...	...	1
10	15	65	10·0	...	573	...	573	7	...	...	...	1	...	...	3	4
30	5	10	2·5	60	17·78	56	183·4	122	7,663	...	...	...	...	1	...	1
15	10	35	...	40	39·11	...	3,911	18	2,789	...	...	...	...	...	...	...
5	15	35	...	30	3,011	...	3,011	10	11,728	...	...	...	...	...	...	...
21·42	18·57	34·28	4·64	37·85												

1st Series. RETURN

Abstract of Medical Examinations of twenty-nine irrigating villages situated

	Villages.	Children of all classes.		Adu					
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.	
		N.	E.	N.	E.	N.	E.	N.	E.
1	Siswal, ...	17	3	...	...	10	...	...	...
2	Kabrair, ...	11	9	...	...	9	...	2	3
3	Salaingurh, ...	11	9	...	...	10	3	2	3
4	Materisham, ...	18	2	...	1	13	1	...	...
5	Mingne Khera, ...	14	6	...	...	9	...	2	...
6	Shahpore, ...	20	...	...	...	16	...	...	...
7	Lodass, ...	18	2	...	...	13	1	1	...
8	Hissar, old Town,...	12	8	...	...	8	...	7	...
9	Do. new Town,...	19	61	6	3	3	...	7	3
10	Raipore, ...	17	3	2	...	9	4	...	...
11	Alipore, ...	17	3	1	...	13	1	...	...
12	Kurrh, ...	16	4	1	...	12	...	...	...
13	Hansi, ...	42	18	6	...	2	4	10	...
14	Do. Mundee, ...	12	8	1	...	9	1	...	2
15	Shaikpoora, ...	11	9	...	...	14	1	...	...
16	Shaikpoora Dhana,	10	10	...	...	11	2	3	...
17	Khera, ...	12	8	...	1	7	2	...	...
18	Narnound, ...	13	7	1	1	14	2	...	...
19	Palee, ...	8	12	...	...	11	5	...	...
20	Mahomedpore Majra, ...	1	19	...	...	5	6	...	1
21	Rajthull, ...	12	8	1	...	10	3	...	...
22	Ramrai, ...	14	6	3	...	11	3	...	...
23	Jheend, ...	25	15	4	...	10	3	1	...
24	Bohut Wallah, ...	12	8	1	...	9	4	...	...
25	Dhatrut, ...	12	8	3	...	...	1	2	2
26	Jaminee, ...	11	9	4	...	6	9	...	...
27	Riyana, ...	6	14	7	5	3	4	...	...
28	Chapur, ...	6	14	...	...	1	...	4	6
29	Suffeedum, ...	19	1	7	...	1	...	...	...
	Total average, ...	...	...	...	...	...	...	...	...

No. 6.

within half a mile of the Hansi Branch of the Western Jumna Canal.

L T S.										
Bunyahs.		Artisans.		Menials.		Total.		Per-centage of adults suffering from fever in the years		
N.	E.	N.	E.	N.	E.	N.	E.	1865.	1866.	1867.
4	...	4	1	1	...	19	1	20	10	25
...	...	5	...	1	...	16	4	25	25	50
1	1	...	...	...	...	13	7	40	25	50
1	...	4	...	...	...	18	2	5	15	15
2	...	2	...	5	...	20	...	35	40	30
...	...	3	...	1	...	20	...	15	20	20
...	...	2	1	2	...	18	2	40	10	20
...	...	2	3	...	...	17	3	...	...	35
23	17	13	1	2	2	54	26	19	16	64
...	...	5	...	...	...	16	4	35	25	40
2	...	1	...	2	...	19	1	10	5	15
3	1	2	...	1	...	19	1	10	5	25
16	4	4	4	9	1	47	13	33	25	12
1	1	2	...	1	2	14	6	20	40	55
1	...	1	...	3	...	19	1	15	25	15
2	...	1	1	...	...	17	3	5	10	30
...	...	1	1	4	4	12	8	30	45	80
...	...	1	...	...	1	16	4	35	40	75
1	1	...	...	1	1	13	7	25	55	65
1	...	2	2	2	1	10	10	15	20	70
4	...	2	...	...	...	17	3	20	20	45
1	...	...	1	1	...	16	4	40	30	65
8	...	2	2	8	2	33	7	40	20	35
3	2	1	...	...	...	14	6	50	15	55
6	1	2	1	...	2	13	7	20	25	65
...	...	...	1	...	...	10	10	60	50	75
1	...	...	...	...	...	11	9	25	35	70
...	...	1	2	5	1	13	9	50	60	60
4	1	1	...	5	1	18	2	30	15	60
...	...	...	...	...	...	...	...	26·44	25·03	45·55

RETURN

	Villages.		Per-centage of enlarged spleens.	Depth of spring level.	Average annual irrigation.		
					Tar.	Daul.	Total.
				Feet.	B.	B.	B.
1	Siswal,	...	10 0	None.	742	153	895
2	Kabrair,	...	52·5	Do.	465	140	605
3	Salaingurh,	...	40 0	Do.	425	263	688
4	Materisham,	...	10 0	Do.	144	240	384
5	Mingne Khera,	...	15·0	Do.	200	222	422
6	Shahpore,	...	...	Do.	138	244	382
7	Lodass,	...	10 0	Do.	10	122	132
8	Hissar, old Town,	...	27·5	91	376	1,959	2,335
9	Do. new Town,	...	55 0	...	...	...	...
10	Raipore,	...	17·5	100	362	325	687
11	Alipore,	...	5 0	75	355	229	584
12	Kurrh,	...	7·5	75	582	498	1,080
13	Hausi,	...	26·0	22	6,475	1,096	7,571
14	Do. Mundee,	...	35·0	...	...	...	...
15	Shaikpoora,	...	25·0	None.	1,225	549	1,774
16	Shaikpoora Dhana,	...	32 5	...	...	...	...
17	Khera,	...	40 0	98	133	195	328
18	Narnound,	...	27·5	57	4,615	82	4,697
19	Palee,	...	47·5	6	2,563	17	2,580
20	Mahomedpore, Majra,	...	72·5	...	429	35	464
21	Rajthull,	...	27·5	None.	893	111	1,004
22	Ramrai,	...	25 0	128	946	259	1,205
23	Jheend,	...	27·5	141	2,115	205	2,320
24	Bohut Wallah,	...	35 0	...	1,019	34	1,053
25	Dhatrut,	...	37 5	90	2,042	235	2,277
26	Jaminee,	...	47 5	90	789	173	967
27	Riyana,	...	57·5	108	916	124	1,040
28	Chapur,	...	57·5	None.	58	85	143
29	Suffeedum,	...	7·5	118	89	136	225
	Total average,	...	30·29	41·34			

No. 6.—*(Concluded.)*

Average annual rice irrigation.	Total area of village land.	Per-centage of Reh land.	Detail of sizes of enlarged spleens.					
B.			V. L.	L.	M.	O.	S.	Total.
23	13,460	...	...	...	1	...	3	4
61	5,853	...	...	...	6	2	5	13
91	4,811	...	1	1	6	2	6	16
13	7,174	...	...	2	...	1	1	4
41	3,841	...	...	...	1	1	4	6
1	4,917	...	...	...	...	...	...	...
None.	2,454	...	...	1	...	1	2	4
Do.	15,292	...	...	...	1	4	6	11
...		...	1	4	24	33	25	87
Do.	5,847	...	...	...	2	1	4	7
2	5,804	...	...	...	1	...	3	4
17	5,310	...	...	...	1	...	4	5
361	34,617	...	2	1	8	11	9	31
...	...	...	...	1	5	6	2	14
27	5,464	...	...	1	...	2	7	10
...	...	...	...	1	4	5	3	13
62	4,441	...	...	3	4	4	5	16
310	10,313	...	...	...	9	1	1	11
581	5,828	None.	...	3	3	8	5	19
283	4,957	...	...	4	9	7	9	29
58	4,803	...	...	...	2	3	6	11
97		...	...	...	2	4	4	10
169		...	...	...	8	4	10	22
237		...	...	...	5	5	4	14
474		...	...	...	5	6	4	15
187		...	...	1	6	11	1	19
359		...	...	1	1	4	7	23
24		...	...	...	9	8	6	23
35	Jheend territory.	...	...	...	...	3	...	3
...	...	...	...	...	...	...	...	...

1st Series. **RETURN**

Abstract of Medical Examinations of twelve Irrigating villages situated

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
1	Sabroude, ...	18	2	1	...	16	...	...	...	3	...	...	...	...	...	20	...
2	Niana, ...	18	2	1	1	11	...	...	...	1	...	2	...	4	...	19	1
3	Dhana, ...	16	4	...	...	9	1	3	1	1	...	4	...	1	...	18	2
4	Sisseea, ...	12	8	1	...	9	1	...	...	3	...	4	...	2	...	19	1
5	Ameerpore Beina,	17	3	2	...	11	1	...	...	...	1	...	2	3	...	18	2
6	Rajpoora, ...	6	14	1	...	11	...	...	...	4	...	2	...	...	2	18	2
7	Mahda, ...	9	11	...	1	11	5	...	...	1	...	1	1	...	...	13	7
8	Jamourie, ...	13	7	1	...	6	...	1	1	1	...	5	1	2	2	16	4
9	Koomla, ...	5	15	1	...	8	4	...	...	1	1	2	...	2	1	14	6
10	Singana, ...	13	7	...	...	4	...	...	...	7	...	1	...	8	...	20	...
11	Kakri, ...	14	6	1	...	15	2	...	...	1	...	1	...	...	...	18	2
12	Dalumwalla, ...	15	5	1	...	11	...	...	...	5	...	2	1	...	...	19	1
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 7.

more than half a mile from the Hansi Branch of the Western Jumna Canal

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	AVERAGE ANNUAL IRRIGATION.			Average annual rice irrigation.	Total area of village land.	Total area of Rch land.	Detail of size of enlarged spleens.					
					Tar.	Daul.	Total.									
1865.	1866.	1867.		Feet.	B.	B.	B.	B.	B.	B.	V L.	L.	M.	O.	S.	Total
15	10	20	5·0	112	12	705	117	None.	3,445	...	...	...	...	...	2	2
15	10	10	7·5	None.	181	145	326	1	8,266	...	...	...	...	2	1	3
35	30	70	15·0	90	1,509	718	2,227	4	11,143	...	...	...	...	3	3	6
15	...	20	22·5	38	6,054	139	6,193	596	14,611	...	...	...	1	2	6	9
20	15	25	0·0	84	2,899	77	2,976	243	6,706	...	...	1	2	...	2	5
25	40	60	40·0	6	2,129	56	2,185	510	3,647	...	...	1	8	4	3	16
20	30	85	45·0	...	1,673	4	1,677	260	2,826	...	...	1	9	5	3	18
10	15	45	27·5	90	455	392	847	88	2,610	...	...	...	5	5	1	11
35	30	75	52·5	45	825	6	858	147	7,789	...	...	1	10	4	6	21
5	...	25	17·5	95	136	451	593	10	Jheend territory.	...	...	...	...	1	6	7
50	15	45	20·0	82	1,019	32	1,051	133		...	...	...	5	...	3	8
15	20	10	15·0	82	496	46	552	19		...	...	...	...	3	3	6
21·66	17·91	40·83	22·29	60·33												

1st Series. **RETURN**

Abstract of Medical Examinations of twenty-five Irrigating villages situated

	Villages.	Children of all classes.		Adults.															
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N	E.	N.	E.
1	Delhi, ...	99	1	9	...	1	...	14	1	20	...	27	2	25	1	96	4
2	Rohilla Khanke Serai,	17	3	1	...	8	1	1	...	1	...	7	...	1	...	19	1
3	Subjee Mundee, ...	17	3	...	...	10	5	2	...	...	...	3	...	...	...	15	5
4	Hyderpore, ...	13	7	3	1	6	4	...	...	2	2	2	...	...	...	13	7
5	Chota Khera, ...	17	3	1	...	12	1	...	...	1	2	1	...	3	...	17	3
6	Bowanuk, ...	11	9	...	...	9	2	...	...	1	...	2	2	3	1	15	5
7	Hurrowlie, ...	13	7	5	...	7	1	...	...	...	2	4	1	...	...	16	4
8	Jattoulah, ...	12	8	3	3	8	1	...	...	1	1	2	1	...	...	14	6
9	Toorkpore, ...	4	16	...	1	12	3	...	...	2	...	1	...	1	...	16	4
10	Chota Khana, ...	17	3	1	...	9	4	...	...	1	3	1	1	...	...	12	8
11	Jurrouth, ...	16	4	3	...	10	...	1	...	1	1	..	...	3	...	19	1
12	Budhana, ...	11	9	2	...	9	...	...	...	1	2	2	1	...	3	14	6
13	Khana Khera, ...	9	11	1	3	5	5	...	...	1	1	2	...	...	2	9	11
14	Butgong, ...	6	14	...	...	4	9	...	...	4	1	2	...	...	...	10	10
15	Jajhee, ...	7	13	2	2	3	7	...	...	...	2	3	1	...	...	8	12
16	Marcheree, ...	6	14	...	2	4	9	...	...	1	1	1	2	...	...	6	14
17	Jooah, ...	10	10	..	...	12	...	...	1	4	...	2	1	...	...	18	2
18	Sitoulee, ...	5	15	1	...	4	8	...	...	1	1	2	1	1	1	9	11
19	Rimana, ...	6	14	1	3	3	5	...	...	1	2	1	2	...	2	6	14
20	Mahomedpore Majra	8	12	...	...	10	9	...	...	1	...	...	...	...	...	11	9
21	Sirdana, ...	8	12	...	...	3	7	...	...	...	1	1	4	2	2	6	14
22	Bullee, ...	11	9	...	1	7	4	1	...	2	...	1	...	1	3	12	8
23	Chumrara, ...	4	16	1	1	9	4	...	...	...	2	1	...	...	2	11	9
24	Didnaree, ...	10	10	1	...	9	4	..	...	...	...	2	3	...	1	12	8
25	Kokrana, ...	16	4	...	...	6	8	...	...	...	...	2	4	...	...	8	12
	Total average,...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 8.

within half a mile of the Delhi Branch of the Western Jumna Canal.

Per-centage of adults suffering from fever in the years.			Per-centage of enlarged spleens.	Depth of spring level.	*Average annual irrigation.*			Average annual rice irrigation.	Total area of village land.	Average of Reh land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.									
1865.	1866.	1867.		Feet.	B.	B.	B.	B.			V L.	L.	M	O.	S.	Total.
23	21	27	2·5	28	326	...	326	61	1,356	...	...	...	1	2	2	5
15	5	20	10·	...	1,458	10	1,468	...	2,348	...	...	...	1	1	2	4
60	40	55	20·	...	2,144	76	2,220	...	...	...	...	...	...	4	4	8
25	15	55	35·	3	922	141	1,063	...	1,804	...	...	1	3	3	7	14
40	25	30	15·	4	1,996	404	2,400	1	...	...	...	...	2	3	1	6
35	20	80	35·	3	2,707	288	2,995	6	6,762	...	...	...	4	6	4	14
20	30	55	27·5	4	325	74	399	2	1,474	...	...	1	2	4	4	11
45	15	70	35·	4	1,631	751	2,382	...	...	...	...	1	6	4	3	14
55	55	20	50·	7	351	29	380	...	0·44	...	...	1	6	11	2	20
25	20	65	27·5	6	636	91	727	43	2,206	40	...	1	4	4	2	11
35	35	35	12·5	6	398	6	404	30	1,630	30	...	..	4	..	...	4
20	15	50	37·5	26	2,094	17	2,111	42	3,375	...	...	1	3	5	6	15
40	35	60	57·5	...	2,710	3	1,713	808	2,890	...	1	4	9	3	5	22
50	45	80	60·	3	7,184	47	7,231	3,628	1,606	...	1	5	7	5	6	24
60	80	80	62·5	3	853	7	860	372	648	...	...	2	10	9	4	25
65	55	85	70·	3	413	9	422	110	...	...	...	6	13	8	1	28
10	25	85	30·	8	3,761	42	3,803	1,324	...	..	...	...	6	3	3	12
75	40	95	75·	8	927	10	937	432	...	...	1	5	7	9	4	26
65	70	100	70·	5	459	83	542	164	...	...	...	2	15	6	5	28
40	40	85	52·5	5	927	10	937	433	...	...	...	...	6	10	5	21
40	40	80	65·	12	712	320	1,032	201	...	...	1	4	8	10	3	26
25	25	80	42·5	7	1,435	201	1,636	509	...	...	...	2	8	4	3	17
35	30	55	62·5	9	1,199	125	1,324	474	2,768	53	...	3	9	10	3	25
45	20	65	45·	...	747	295	1,042	257	2,164	31	...	4	6	6	2	18
20	10	70	75·	8	127	329	456	43	2,991	8	...	3	8	14	1	26
38·72	32·44	63·28	43·0	6·48												

1st Series. **RETURN**

Abstract of Medical Examinations of fifty irrigating villages distant

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
1	Wazeerpore ...	12	8	1	1	5	6	5	...	...	...	...	1	...	1	11	9
2	Badlee, ...	12	8	2	...	9	4	...	...	...	...	3	1	...	1	14	6
3	Burra Khera, ...	17	3	1	...	12	3	...	...	...	...	...	...	3	1	16	4
4	Kuttloopore, ...	15	5	1	...	10	1	...	...	3	...	1	2	2	...	17	3
5	Mundouree, ...	10	10	...	...	12	3	...	...	1	1	1	...	2	...	16	4
6	Chandpore, ...	6	14	...	...	7	3	...	...	...	...	3	1	6	...	16	4
7	Kanjawla, ...	7	13	3	...	8	4	...	...	3	...	1	1	...	...	15	5
8	Kore Punjab, ...	9	11	...	...	...	...	17	...	1	...	1	...	1	...	20	...
9	Kootubgurh, ...	13	7	1	1	15	1	...	...	...	...	2	...	...	...	18	2
10	Moongusipore,	16	4	2	...	8	2	...	...	1	...	2	...	2	3	15	5
11	Ferozepore, ...	11	9	1	...	12	2	...	...	1	...	2	1	...	1	16	4
12	Bazeedpore, ...	14	6	...	...	18	1	...	...	...	...	...	...	1	...	19	1
13	Kuttaoora, ...	15	5	...	1	12	2	...	...	1	...	2	1	1	...	16	4
14	Burra Thana, ...	18	2	2	...	5	3	...	...	2	2	3	...	1	2	13	7
15	Khandra, ...	15	5	1	1	8	...	1	...	4	...	4	1	...	...	18	2
16	Guddee Balawalee,	13	7	...	...	11	3	...	...	...	...	2	...	4	...	17	3
17	Redoo, ...	10	10	1	...	11	3	...	...	1	1	2	...	...	1	15	5
18	Maheepore, ...	6	14	...	...	9	8	...	...	...	2	...	1	...	...	9	11
19	Saleemsur Majra,	9	11	...	...	11	5	...	...	...	1	2	...	1	...	14	6
20	Lahoree Teeba,	9	11	...	..	6	9	...	...	...	...	2	1	1	1	9	11
21	Mohana, ...	9	11	1	...	7	...	...	1	4	2	3	...	2	...	17	3
22	Nyana, ...	12	8	1	1	8	1	...	...	2	1	1	2	2	1	14	6
23	Syssana, ...	20	...	1	...	10	...	...	...	2	...	6	...	1	...	20	...
24	Suellana, ...	16	4	...	...	9	...	2	...	3	...	4	...	1	1	19	1
25	Bidlan, ...	16	4	...	...	9	4	...	...	1	1	3	2	...	...	13	7
26	Guddee, ...	16	4	...	...	14	...	...	...	3	...	3	...	...	...	20	...
27	Chunowlee, ...	17	3	...	...	13	...	1	...	...	...	4	...	2	...	20	...

No. 9.—(A.)

more than half a mile from the Dehli Branch of the Western Jumna Canal.

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Average annual irrigation.			Average annual rice irrigation.	Total area of village land.	Per-centage of Kch land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.									
1865.	1866.	1867.		Feet.	B.	B.	B.	B.	B.	B.	V L.	L.	M.	O.	S.	Total
40	20	40	42·5	6	1,610	337	1,947	1	...	...	...	...	5	11	1	17
...	10	55	35·0	35	...	...	...	...	...	...	...	...	8	2	4	14
30	20	45	17·5	4	2,165	385	2,550	...	...	...	...	...	2	4	1	7
15	10	40	20·0	10	1,031	751	1,782	2	...	...	...	1	4	2	1	8
40	30	55	35·0	7	894	144	1,038	...	...	...	...	1	5	5	3	14
35	15	30	45·0	6	611	...	611	19	...	...	...	...	6	6	6	18
35	15	70	45·0	2	1,279	...	1,279	15	...	...	...	...	4	8	6	18
20	15	20	27·5	9	1,072	...	1,072	15	...	...	...	...	1	5	5	11
20	20	55	22·5	15	480	5	485	36	...	...	...	...	5	1	3	9
25	30	60	22·5	4	427	...	427	8	63,327	270	...	...	4	4	1	9
5	5	25	32·5	7	595	...	595	75	...	...	...	...	4	4	5	13
30	20	75	17·5	7	933	4	937	88	...	...	...	...	2	3	2	7
30	25	75	22·5	7	527	...	527	...	...	...	...	...	4	3	2	9
60	30	30	22·5	24	1,171	198	1,369	1	4,236	22·0	1	...	4	3	1	9
35	30	55	17·5	2	2,805	5	2,810	140	4,066	...	...	...	3	4	...	7
15	25	30	25·0	12	467	2	499	...	...	...	...	...	2	4	4	10
50	30	60	37·5	21	...	...	...	...	...	...	...	...	5	2	8	15
20	67	100	62·5	...	...	...	...	...	...	...	...	3	14	5	3	25
35	30	55	42·5	9	1,484	15	1,499	...	...	...	...	2	4	7	4	17
75	75	75	55·0	10	592	77	669	87	...	...	...	1	10	6	5	22
20	20	65	35·0	4	2,372	330	2,702	126	...	...	...	...	3	6	5	14
55	40	50	35·0	12	574	286	860	6	...	...	...	...	5	3	6	14
25	25	25	0·0	40	2,857	60	2,917	35	12,279	...	...	...	...	...	...	...
10	5	25	12·5	40	2,877	12	2,889	...	5,188	...	...	...	1	2	2	5
25	20	65	27·5	26	2,094	17	2,111	42	42,107	2·3	...	1	3	5	2	11
...	10	...	10·0	...	...	...	...	...	...	...	...	...	...	...	4	4
15	15	25	7·5	18	295	1	296	...	1,238	...	...	...	...	...	3	3

1st Series. **RETURN**

	Villages. *Continued.*	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
28	Mitteandao, ...	16	4	...	...	14	...	...	...	...	...	3	...	3	...	20	...
29	Choulka, ...	9	11	3	3	8	3	...	...	...	...	1	...	1	1	13	7
30	Sehara, ...	11	9	...	...	8	7	...	...	1	1	2	1	...	...	11	9
31	Nirthan, ...	12	8	1	...	5	2	...	...	1	...	3	...	5	3	15	5
32	Nickloie, ...	9	11	...	...	8	7	...	...	1	...	1	3	...	...	10	10
33	Ahoolana, ...	11	9	...	...	11	1	...	...	1	1	3	2	...	1	15	5
34	Pooghtulla, ...	10	10	1	...	9	2	1	1	2	1	1	1	1	...	15	5
35	Dhindar, ...	12	8	...	1	5	6	...	...	3	...	1	...	3	1	12	8
36	Mandee, ...	9	11	1	1	5	4	...	...	1	3	2	1	1	1	10	10
37	Noulta, ...	9	11	...	...	11	3	...	...	2	2	2	...	...	...	15	5
38	Hurtharee, ...	7	13	...	...	...	...	7	5	2	...	3	1	2	...	14	6
39	Dahur, ...	15	5	...	...	7	5	...	...	2	1	4	1	...	...	13	7
40	Bhsujoul, ...	14	6	1	...	14	3	...	...	1	1	...	...	...	...	16	4
41	Israna, ...	17	3	2	...	9	...	...	...	3	...	4	...	1	1	19	1
42	Burra Joundur,	10	10	...	2	10	1	...	...	1	1	5	...	...	...	16	4
43	Brahmin Majra,	12	8	1	...	8	5	...	...	1	2	2	1	...	...	12	8
44	Badona, ...	9	11	...	...	6	2	4	2	2	...	1	2	...	1	13	7
45	Jatowul, ...	7	13	...	...	5	9	...	...	2	2	2	...	...	...	9	11
46	Chota Asan, ...	11	9	1	3	3	7	...	...	...	4	...	2	...	...	4	16
47	Burra Asan, ...	9	11	1	...	3	4	2	3	1	2	3	1	...	...	10	10
48	Nohura, ...	10	10	1	2	5	4	1	...	1	...	2	1	3	...	13	7
49	Balgotunka, ...	5	15	1	...	5	7	...	...	...	1	3	3	...	...	9	11
50	Baolee, ...	10	10	...	1	...	...	7	3	...	2	3	2	2	...	12	8
	Total average,...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 9. (A.)—*Concluded.*

Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Average annual irrigation.			Average annual rice irrigation.	Total area of village land.	Average per-centage of Reh land.	Detail of sizes of enlarged spleens.					
					Tar.	Daul.	Total.									
1865.	1866.	1867.		Feet.	B.	B.	B.	B.			V.L.	L.	M.	O.	S.	Total.
5	10	15	10·	18	507	...	507	...	2,041	...	...	...	...	...	4	4
80	55	60	45·	7	...	...	...	...	1,739	...	...	...	4	7	7	18
75	45	70	45·	7	1,526	...	1,526	139	2,754	...	...	2	3	8	5	18
45	35	65	35·5	5	975	...	975	139	...	...	1	2	2	...	8	13
75	6	60	52·5	5	852	3	855	226	...	...	...	...	8	3	10	21
40	35	65	35·	15	994	970	1,964	161	...	...	...	1	7	4	2	14
20	5	85	37·5	20	1,520	236	1,776	115	...	...	...	...	3	10	2	15
30	45	65	40·	12	357	138	495	34	1,171	...	...	...	8	8	...	16
40	50	70	52·5	7	2,838	222	3,060	908	5,560	2	...	...	9	8	4	21
30	25	70	40·	12	2,034	1,548	3,582	233	7,272	17	...	2	8	5	1	16
40	20	45	47·5	15	265	180	445	9	5,560	2	...	1	6	9	3	19
45	35	60	30·	18	1,029	271	1,300	133	2,069	...	1	2	5	3	1	12
40	40	75	25·	11	1,018	175	1,193	80	2,955	...	...	1	6	3	...	10
35	40	20	10·	18	1,869	32	1,901	63	4,888	...	...	...	2	1	1	4
55	30	55	35·	20	1,037	110	1,147	10	2,489	...	...	1	7	5	1	14
25	30	80	40·	12	1,205	68	1,273	47	2,390	...	1	2	6	4	3	16
20	15	75	45·	...	1,122	285	1,467	166	3,128	5	...	1	3	9	5	18
20	15	75	60·	14	730	165	895	229	3,128	5	1	1	10	9	3	24
90	60	95	62·5	8	505	50	555	88	1,931	20	...	5	11	9	...	25
45	40	80	52·5	...	1,238	67	1,305	298	5,129	3	2	...	3	8	8	21
40	45	70	42·5	10	584	308	892	184	3,360	38	...	3	8	4	2	17
45	55	80	75·	13	744	839	1,584	551	5,509	19	...	2	11	12	1	26
40	60	45	45·	6	1,228	357	1,556	784	5,632	20	2	1	4	8	3	18
34·9	29·06	55·7	34·26	12·58												

2nd Series. **RETURN No. 10.**

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in nineteen villages situated within the angle formed by the Rohtak and Delhi Canals.

Vide Report, Para 72.

Villages.	*Per-centage of adults suffering from fever in the years.*			Per-centage of enlarged spleens.	Depth of spring level.	Per-centage of Reh soil.
	1865.	1866.	1867.			
Baljatan, ...	45	55	80	75·0	13	19
Shera, ...	15	25	75	67·5	6	32
Mudlouda, ...	30	45	30	17·5	...	38
Asan Burra, ...	45	40	80	52·5	19	3
Asan Chota, ...	90	60	95	62·5	8	20
Kokrana, ...	20	10	70	75·0	8	8
Balsee, ...	65	65	70	62·5	4	...
Wysulee, ...	60	60	95	77·5	12	...
Loharee, ...	20	45	75	22·5	10	...
Badowa, ...	20	15	75	45·0	...	21
Brahmin Majra, ...	25	30	80	40·0	12	...
Whur, ...	5	25	25	15·0	7	...
Burra Joundun, ...	55	30	55	35·0	20	...
Noulta, ...	30	25	70	40·0	12	17
Israna, ...	35	40	20	10·0	18	...
Palree, ...	25	55	65	47·5	6	...
Mandee, ...	40	50	70	52·5	7	2
Chumrana, ...	35	30	55	62·5	9	53
Bulhei, ...	25	25	80	42·5	7	...
Total Average, ...	36·05	38·42	66·57	46·97	10·42	...

2nd Series. **RETURN No. 11.**

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in nine villages situated on the line proposed for the Western Jooah Drainage.

Vide Report, Para 74.

	Villages.	*Per-centage of adults suffering from fever in the years.*			Per-centage of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
		1865.	1866.	1867.				
1	Nainah, ...	55	40	50	35·0	12		
2	Mohanah, ...	20	20	65	35·0	4		The Jooah swamp would naturally drain eastwards; but is obstructed by the canal.
3	Jajhee, ...	60	80	80	62·5	3		
4	Loharee Teeba, ...	75	75	75	55·0	10		
5	Salumsur Majra, ...	35	30	55	42·5	9		
6	Mahpore, ...	20	67	100	62·5	...		
7	Ridoa, ...	50	30	60	37·5	21		
8	Hoomaionpore, ...	5	10	25	...	48		Baranee village.
9	Guddee, ...	...	10	...	10·0	...		
	Total average, ...	35·55	40·22	56·66	37·77	11·88		

2nd Series.

RETURN No. 12.

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in four villages situated near the proposed Eastern Jooah Drainage.

Vide Report, Para 74.

	Names of villages.	*Per-centage of adults suffering from fever in the years.*			Per-centage of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
		1865.	1866.	1867.				
1	Jooah, ...	10	25	85	30 0	8		These villages are situated in a loop formed by the water-shed of the country and the canal, the drainage being thus entirely blocked.
2	Kurreomee, ...	25	40	75	70 0	2		
3	Marchera, ...	65	55	85	70 0	3		
4	Chittana, ...	30	10	70	37 5	4		
	Total average, ...	32·5	32 5	78 75	51 87	4·25		

2nd Series.

RETURN No. 13.

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in ten villages situated on the line of the Kandrah Drainage.

Vide Report, Para 74.

	Names of Villages.	*Per-centage of adults suffering from fever in the years*			Per-centage of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
		1865.	1866.	1867.				
1	Butgong, ...	50	46	80	60 0	3		
2	Northan, ...	45	35	65	32 5	5		
3	Nicklocc, ...	75	60	75	52 5	5		
4	Seharee, ...	75	45	70	45 0	7		
5	Kandrah, ...	35	30	55	17 5	2		
6	Jurouttee, ...	35	35	35	12 5	6		
7	Buddanah, ...	20	15	50	37 5	5		
8	Choulka, ...	80	55	60	4 55	7		
9	Miteemdo, ...	5	10	15	10 0	18		
10	Chinowlee, ...	15	15	25	7 5	18		
	Total average, ...	43 5	34 5	53 0	32 05	7 6		

2nd Series. **RETURN No. 14.** Group No. 1.

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in six villages situated along the line of drainage obstructed by Bovaneh Laka Rajbaha and by the high banks of Kupender Rajbaha.

Vide Report, Para 73.

Names of Villages.	*Per-centage of adults suffering from fever in the years*			Per-centage of cases of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
	1865.	1866.	1867.				
Nowlta, ...	30	25	70	40·0	12	17	
Pulree, ...	25	55	65	47·5	6	...	No culverts; flooding relieved partially by cutting through the Rajbahas.
Mandee, ...	40	50	70	52·5	7	2	
Chumrara, ...	35	30	55	62·5	9	53	
Bullee, ...	25	25	80	42·5	7	...	
Pooghtulla, ...	20	5	85	37·5	20	...	Poogthulla villages dammed up the drainage above their boundary.
Total average, ...	29·16	31·66	73·83	47·08	10·16	...	

2nd Series. RETURN No. 15. Group No. 2.

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in the villages situated near the Rajbahas mentioned in para 74 of Report.

	Names of Villages.	*Per-centage of adults suffering from fever in the years*			Per-centage of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
		1865.	1866.	1867.				
1	Juttoulee, ...	45	15	70	35·0	4		Drainage obstructed by the Teekri, Oorchundur, Boodempore and Sultanpore Rajbahas; only one small culvert under Teekri Rajbaha, close to Kootubgurh.
2	Chandpore, ...	35	15	30	50·0	6		
3	Kujowla, ...	35	15	70	45·0	2		
4	Kore Punjal, ...	20	15	20	27·5	9		
5	Kootub Gurh, ...	20	20	55	22·5	15		
6	Moongushpore, ...	25	30	60	22·5	4		
7	Ferozepore, ...	5	5	25	32·5	7		
8	Bayeedpore, ...	30	20	75	17·5	7		
9	Kulleena, ...	30	25	75	22·5	7		
	Total average, ...	27·22	17·77	53·33	30·55	6·77		

2nd Series. RETURN No. 16. Group No. 3.

Return showing the amount of Fever, Spleen Disease and Deterioration from Reh in 6 villages situated on drainage line obstructed by Wyseeree Rajbaha.

Paragraph 61 *of Report.*

Names of Villages.	*Per-centage of adults suffering from fever in the years*			Per-centage of cases of enlarged spleens.	Depth of spring level.	Per-centage of Reh land.	Remarks.
	1865.	1866.	1867.				
Shera, ...	15	25	75	67 5	6	32	
Mudlouda, ...	30	45	30	17·5	...	38	
Balsee, ...	65	65	70	62·5	4	...	
Wyseeree, ...	60	60	95	77·5	12	...	
Laharee, ...	20	45	75	12 5	10	...	
Uhur, ...	5	25	25	15·0	7	...	Below Uhur the drainage line crosses the canal, being obstructed by it.
Total average, ...	32·5	44·16	61 66	42 08	6 5	...	

3rd. Series. **RETURN No. 17.**

Abstract of Medical Examination of ten villages situated in the Khadir of the river Jumna and unirrigated by the Canal.

	Villages.	Children of all classes.		Adults.												Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Detail of sizes of enlarged spleens.					
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.						V	L.	L.	M	O.	S.	Total.
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	1865.	1866.	1867.		Feet.						
1	Dyheerpore, ...	12	8	...	...	9	2	...	...	1	1	6	...	...	1	16	4	40	20	45	30·0	10	...	...	1	10	1	12
2	Mookudderpore,	17	3	...	...	17	1	...	...	...	...	...	...	2	...	19	1	15	20	15	10·0	9	...	1	...	2	1	4
3	Shadrah, ...	20	...	3	...	1	...	2	1	2	...	8	..	3	...	19	1	15	15	30	2.5	...	..	1	...	...	...	1
4	Jytheree, ...	14	6	1	...	13	1	1	...	...	...	4	...	...	...	19	1	20	35	60	17·5	11	...	...	...	3	4	7
5	Barouta, ...	13	7	...	...	3	...	6	1	2	...	4	...	2	2	17	3	45	35	55	25·0	18	...	...	...	6	4	10
6	Boodhar, ...	18	2	...	...	15	1	...	...	...	...	4	...	...	...	19	1	40	5	15	7·5	15	...	...	...	2	1	3
7	Raie, ...	17	3	...	...	17	...	...	...	1	...	2	...	...	...	20	...	10	5	25	7·5	18	...	...	...	...	3	3
8	Seijowlee, ...	17	3	5	1	9	...	...	...	2	...	2	...	1	...	19	1	30	5	20	10·0	15	...	...	1	1	2	4
9	Jachowlee, ...	17	3	2	...	10	...	...	...	5	...	1	...	2	...	20	...	30	5	20	7·5	15	...	...	...	1	2	3
10	Menowlee, ...	18	2	1	...	15	...	...	...	1	...	1	...	2	...	20	...	20	15	20	5·0	15	...	...	...	1	1	2
	Total average,...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26·5	16·	30·5	12·25	12·6	...	...	...	...	...	...

3rd Series. **RETURN**

Abstract of Medical Examination of 20 villages situated in Proximity

	Names of Villages.	Children of all classes.		Adu-									
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
Western Villages.	Shreepore, ...	19	1	...	...	13	1	...	...	2	...	2	...
	Nujjuffghur, ...	20	...	...	...	7	...	5	..	5	1	2	...
	Badlee, ...	19	1	1	...	12	...	...	...	2	...	5	...
	Oojiva, ...	19	1	...	...	16	...	...	...	...	...	1	...
	Natrow, ...	18	2	4	...	9	...	...	...	...	...	1	...
	Jafferpore, ...	20	...	...	...	16	...	...	...	...	...	3	...
	Shumushpore, ...	19	1	...	...	17	...	...	...	1	...	1	...
	Suggenpore, ...	17	3	...	...	18	...	...	...	...	...	...	...
	Dewakhana, ...	17	3	1	...	16	1	...	...	...	1	...	...
	Palepa, ...	19	1	...	...	7	...	...	...	7	...	3	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...
Eastern Villages.	Bupaies, ...	17	3	...	...	12	3	...	...	1	...	3	...
	Khealah, ...	17	3	1	...	15	1	1	...	1	...	1	...
	Kujsoopore, ...	19	1	1	...	14	...	...	...	1	...	1	...
	Badeelah, ...	18	2	1	...	15	...	...	...	...	...	1	...
	Kukrowla, ...	20	...	2	...	15	...	...	...	3	...	...	...
	Neelowtee, ...	17	3	...	...	14	1	...	...	...	...	3	...
	Runhowla, ...	17	3	...	...	17	...	...	...	...	...	...	...
	Nungloe Jatanka, ...	20	...	...	...	10	...	1	...	5	...	4	...
	Nungloe Syudanka, ...	19	1	1	...	4	...	12	...	...	...	3	...
	Braprowla, ...	19	1	2	1	14	...	...	...	2	...	...	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...
	Grand Total, ...	...	...	...	...	...	...	...	...	...	...	...	...

No. 18.

to the Nujjuffghur Jheels or Branches of the Jheels.

LTS.													
Meniats.		Total adults.		Per-centage of adults suffering from fever in the years			Per-centage of enlarged spleens.	Spring level.	Detail of sizes of enlarged spleens.				
N.	E.	N.	E.	1865.	1866.	1867.		Feet.	V L.	L.	M.	O.	S.	Total.
2	...	19	1	20	10	10	5·0	26	...	...	1	...	1	3
...	...	19	1	45	20	35	2·5	15	...	...	...	1	...	1
...	...	20	...	20	20	5	2·5	20	...	...	...	1	...	1
3	...	20	...	15	15	...	2·5	18	...	...	...	...	1	1
5	1	19	1	20	5	25	7·5	17	...	...	...	1	2	3
1	...	20	...	25	5	10	...	9	...	...	...	...	...	...
1	...	20	...	5	5	10	2·5	12	...	...	...	...	1	1
2	...	20	...	5	5	5	7·5	32	...	...	1	...	2	3
1	...	18	2	15	...	25	12·5	20	...	...	...	2	3	5
2	1	19	1	20	10	10	5·0	...	...	...	...	1	1	2
...	...	...	...	19·	9·5	13·5	4·75	10·9	...	...	...	...	...	...
1	...	17	3	15	...	5	15·0	15	...	...	1	2	3	6
...	...	19	1	10	5	5	10·0	10	...	...	1	1	2	4
3	...	20	...	...	...	...	2·5	20	...	...	...	1	...	1
2	1	19	1	5	5	5	7·5	15	...	...	...	1	2	3
...	...	20	...	10	5	5	...	12	...	...	...	...	...	...
2	...	19	1	10	5	20	10·0	12	...	1	...	1	2	4
3	...	20	...	...	5	15	7·5	22	...	...	...	1	2	3
...	...	20	...	30	10	15	...	34	...	...	...	...	...	...
...	...	20	...	15	5	5	2·5	40	...	...	...	1	...	1
1	...	19	1	10	...	20	5·0	15	...	...	...	...	2	2
...	...	...	...	10·5	4·	9·5	6·0	19·5	...	...	...	...	...	...
...	...	...	...	14·75	6·75	11·50	5·37	18·20	...	...	...	...	...	...

4th Series. RETURN

Abstract of Medical Examination of ten villages in the Rohtuck District

	Villages.	Children of all classes.		Adu									
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
Rohtuck.	Kyloe, ...	19	1	...	...	5	...	7	...	3	...	4	...
	Roorkee, ...	17	3	...	...	7	...	...	...	5	...	8	...
	Poolungee, ...	20	...	5	...	8	...	...	...	1	...	4	...
	Moongan, ...	20	...	1	...	14	...	...	...	2	...	3	...
	Ussen, ...	17	3	2	...	15	1	...	...	...	...	2	...
	Bhalowt, ...	18	2	5	...	9	...	...	...	3	...	3	...
	Bheree, ...	20	...	...	...	12	...	...	...	2	...	4	...
	Bhajpoora, ...	18	2	...	...	13	...	...	...	...	...	5	...
	Mehim, ...	20	...	1	...	12	...	...	...	5	...	1	...
	Reinee Marajpore, ...	18	2	...	...	18	...	...	...	2	...	...	...
	Total average,	...	...	...	...	...	...	...	...	...	...	...	...
Hissar.	Moondahal, ...	16	4	1	...	11	...	...	...	4	...	3	...
	Soorkee, ...	20	...	...	...	14	...	...	...	2	...	4	...
	Ghuddee, ..	19	1	3	...	12	...	...	...	2	...	2	...
	Naulee, ...	18	2	1	...	13	...	...	...	1	...	1	...
	Gungowa, ...	20	...	...	...	8	...	1	...	6	...	5	...
	Kymeree, ...	18	2	7	...	7	...	...	...	1	...	5	...
	Meerka, ...	18	2	1	...	9	1	...	...	1	...	6	...
	Dahera, ...	18	2	3	...	12	...	...	...	3	...	1	...
	Tulwundee, ...	18	2	2	...	6	...	6	...	1	...	3	..
	Soultanpore, ...	20	...	1	...	13	...	...	...	2	...	6	...
	Total average,	...	...	...	...	...	...	...	...	...	...	...	...

No. 19.

and ten in the Hissar District, all unirrigated and Bhyranee.

L T S.				Per-centage of adults confessing to having had fever during the years			Per-centage of enlarged spleens.	Depth of spring level.	Detail of sizes of enlarged spleens.					
Menials.		Total.												
N.	E.	N.	E.	1865.	1866.	1867.			V L.	L	M.	O.	S.	Total.
1	...	20	...	20	15	15	2 5	77	...	...	...	1	...	1
...	...	2	...	...	5	15	7 5	77	...	...	...	3	...	3
2	...	20	...	10	...	5	...	67	...	...	...	...	...	...
...	...	20	...	10	5	5	...	67	...	...	...	..	...	...
...	...	19	1	5	...	15	10 0	67	...	...	...	...	4	4
...	...	20	...	5	20	5	5 0	90	...	...	...	1	1	2
2	...	20	...	10	...	20	...	65	...	...	...	...	...	...
2	...	20	...	5	...	...	5 0	60	...	...	...	...	2	2
1	...	20	...	25	15	30	...	100	...	...	...	...	...	...
...	...	20	...	20	...	15	5 0	120	...	...	...	...	2	2
...	...	...	...	11	6	11 5	3 5	79 0						
1	...	20	...	10	20	15	10 0	120	...	...	1	...	3	4
...	...	20	...	10	5	25	...	150	...	...	...	...	...	...
1	...	20	...	15	10	10	2 5	125	...	..	...	...	1	1
4	...	20	...	5	5	...	5 0	150	...	...	...	1	1	2
...	...	20	...	5	15	15	...	150	...	...	...	...	...	...
...	...	20	...	15	15	10	...	90	...	...	...	...	2	2
1	1	18	2	5	10	15	10·0	120	...	...	...	3	1	4
...	1	19	1	15	20	15	7·5	100	...	...	1	...	2	3
2	...	20	...	15	15	25	5 0	130	...	...	...	...	2	2
...	...	20	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	9 5	11 5	13 0	4·0	1,245 0						

4th Series. **RETURN**

Abstract of Medical Examinations of ten villages in the Delhi, and

District.	Names of Villages.	Children of all classes.		Adu-									
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
Delhi.	Majra Mulla, ...	17	3	...	...	15	1	...	...	2	...	2	...
	Salyra, ...	15	5	1	...	16	...	...	..	...	...	3	...
	Meerowlee, ...	18	2	2	...	5	...	...	...	8	...	1	...
	Lado Serai, ...	20	...	5	...	14	...	...	...	...	...	1	...
	Chullepore, ...	19	1	1	...	8	...	4	...	1	...	3	...
	Mardan, ...	19	1	1	...	15	...	...	...	1	...	2	...
	Rajpoora, ...	19	1	...	...	19	1	...	...	...	...	...	...
	Salhance, ...	19	1	...	...	...	...	16	...	...	...	...	...
	Chananoolla, ...	19	1	1	...	5	...	12	...	...	...	1	...
	Futtehpore, ...	20	...	2	...	18	...	...	...	...	...	...	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...
Karnaul.	Poondruck, ...	16	4	...	...	17	2	...	...	...	...	...	...
	Kachwa, ...	17	3	...	...	1	...	13	...	5	...	...	...
	Buhlalpore, ...	15	5	3	...	...	...	9	1	2	...	...	...
	Balas, ...	16	4	2	...	...	...	14	...	2	...	1	...
	Ukana, ...	18	2	...	...	16	1	...	...	1	...	...	...
	Seersee, ...	15	5	1	...	7	1	...	...	2	...	7	1
	Oochana, ...	13	7	...	...	16	2	...	...	...	...	2	...
	Shanghur, ...	19	1	...	...	14	1	...	...	3	1	...	...
	Kumowree, ...	16	4	3	...	3	...	...	1	8	1	...	2
	Majoora, ...	17	3	1	...	15	1	...	...	...	...	2	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...

No. 20.

ten in the Karnaul District, all unirrigated and Bhyranee.

LTS.													
Menials.		Total.		Per-centage of adults confessing to having had fever in the years			Per-centage of enlarged spleens.	Depth of spring level.	Detail of sizes of enlarged spleens.				
N.	E.	N.	E.	1865.	1866.	1867.		Feet.	V L.	L.	M.	O.	S.	Total.
...	...	19	1	5	15	30	10·0	33	...	...	...	1	3	4
...	...	20	...	15	10	45	12·5	22	...	...	1	1	3	5
4	...	20	...	37	25	20	5·0	40	...	...	...	1	1	2
...	...	20	...	5	5	10	...	60	...	...	...	...	...	...
3	...	20	...	40	20	15	2·5	70	...	...	...	1	...	1
1	...	20	...	10	...	15	2·5	100	...	...	...	...	1	1
...	...	19	1	...	...	...	0·5	60	...	...	...	...	2	2
4	...	20	...	30	15	10	2·5	60	...	...	...	...	1	1
1	...	20	...	15	10	10	2·5	70	...	...	1	...	...	1
...	...	20	...	20	5	10	...	60	...	...	...	...	...	...
...	...	...	...	16·5	10·5	16·5	3·8	57·5	...	...	...	...	...	...
1	...	18	2	20	20	60	15·0	30	...	...	1	3	2	6
...	1	19	1	25	20	35	10·0	60	...	...	...	2	2	4
4	1	18	2	40	10	70	17·5	75	...	...	2	3	2	7
1	...	20	...	10	10	45	10·0	70	...	...	1	1	2	4
2	...	19	1	15	10	30	7·5	75	...	...	1	...	2	3
1	...	18	2	5	10	45	17·5	36	...	...	1	5	1	7
...	...	18	2	25	10	40	22·5	24	...	...	1	4	4	9
...	1	17	3	25	20	55	10·0	30	...	...	1	2	1	4
2	...	17	3	20	20	40	17·5	40	...	...	4	1	2	7
1	...	19	1	20	15	15	10·0	90	...	...	1	...	3	4
...	...	...	...	20·5	14·5	43·5	13·75	53	...	...	...	...	...	...

5th Series. **RETURN**

Abstract of Medical Examination of five irrigating, and five

	Villages.	Children of all classes.		Adults.													
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.		Menials.		Total.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N	E.	N.	E.
Irrigating.	Beertah, ...	20	...	...	...	14	...	...	...	6	...	...	...	...	...	20	...
	Sehara, ...	20	...	...	...	15	...	...	...	1	...	4	...	...	...	20	...
	Naderh, ...	19	1	1	...	11	...	...	...	3	...	2	1	2	...	19	1
	Ujein, ...	20	...	1	...	14	...	...	...	2	...	1	...	2	...	19	...
	Goorkaree, ...	20	...	1	...	12	...	...	...	2	...	5	...	...	...	19	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Non-Irrigating.	Sukaf, ...	20	...	...	...	10	...	1	...	...	...	9	...	...	...	20	...
	Sullaree, ...	20	...	...	...	17	...	2	...	1	...	...	...	...	...	20	...
	Dowlutpore, ...	20	...	2	...	5	1	3	...	2	...	5	...	2	...	18	1
	Rajol, ...	20	...	...	...	16	1	...	...	...	...	1	...	2	...	20	...
	Nandrool, ...	20	...	...	...	6	...	3	...	3	...	...	...	8	...	20	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

No. 21.

non-irrigating villages in the Kangra District.

Per-centage of adults who confess to having had fever in the years			Per-centage of diseased spleens.	Depth of water below surface spring level.	Average amount of Tar irrigation.	Average amount of Daul irrigation.	Average amount of Rice cultivation.	Total irrigation.	Detail of enlarged spleens.					
1865.	1866.	1867.		Feet.	B.	B.	B.	B.	V L.	L.	M	O.	S.	Total.
5	15	10	...	No wells.	434	...	225	544	...	...	...	...	...	...
...	5	...	...	No wells.	602	...	400	773	...	...	...	...	...	...
5	20	...	5	No wells.	541	...	400	541	...	...	1	...	...	1
10	10	...	...	21 feet.	1,227	...	1,075	1,254	...	...	...	...	...	...
5	5	10	...	No wells.	402	...	250	441	...	...	...	...	...	...
5	10·5	4	1	...										
...	10	...	...	6 feet.	...	...	25	...	...	...	...	...	...	...
...	10	5	...	12 feet.	...	...	200	...	...	...	...	...	...	...
..	25	20	5	10 feet.	...	...	200	...	...	...	1	...	...	1
...	15	...	...	8 feet.	...	...	1,500	...	...	...	...	...	...	...
5	15	...	...	8 feet.	...	...	15	...	...	...	...	...	...	...
1	15	5	1	8 8										

6th Series. **RETURNS**

Abstract of Medical Examination of four villages situated in the Umballa

	Villages.	Children of all classes.		Adu									
				Brahmins, Fakeers, &c.		Hindoo cultivators.		Mahomedan cultivators.		Bunyahs.		Artisans.	
		N.	E.	N.	E.	N.	E.	N.	E.	N.	E.	N.	E.
Umballa.—22.	Munee Majra Mowlee,	22	5	...	...	60	8	...	...	5	...	...	...
	„ Pubhat, ...	40	2	...	...	52	3	...	...	5	1	4	1
	„ Abehpore, ...	24	1	2	...	58	1	...	...	1	...	1	...
	„ Burra Ferozepore, ...	19	4	...	...	30	4	7	1	...	...	...	...
	„ Durd, ...	12	...	...	...	49	...	...	...	...	...	13	...
	„ Chundee, ...	33	3	...	...	42	1	...	...	20	...	...	1
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...
Jhelum.—23.	Tuttianwalla, ...	19	1	2	...	...	...	6	2	7	1	2	...
	Kala, ...	20	...	1	...	...	...	16	1	...	1	...	1
	Ratheem, ...	20	...	3	...	...	...	7	...	7	2	...	...
	Chukeasa, ...	18	2	...	...	3	...	12	3	1	...	1	...
	Layerpore, ...	20	...	...	...	...	...	18	...	...	1	...	1
	Meeana Chuck, ...	20	...	...	...	6	...	10	1	2	...	1	...
	Begpore, ...	19	1	...	...	...	...	18	2	...	...	...	...
	Chuppah, ...	20	...	...	...	...	...	20	...	...	...	...	...
	Khokhur, ...	20	...	...	...	...	...	13	3	...	...	...	...
	Salah, ...	20	...	...	...	...	...	12	...	2	...	...	...
	Total average, ...	...	...	...	...	...	...	...	...	...	...	...	...

Nos. 22-23.

District, and ten situated in the Jhelum District.

L T S.				Per-centage of adults confessing to having had fever in the years			Per-centage of diseased spleen.	Depth of water below surface spring level.	Detail of sizes of enlarged spleen.					
Menials.		Total.												
N.	E.	N.	E.	1865.	1866.	1867.		Feet.	VL.	L.	M.	O.	S.	Total.
...	...	64	8	70	per cent.		13	21	1	...	7	3	2	13
3	1	64	6	No house escapes.			7	16	...	...	3	3	2	8
...	1	62	2		Ditto,		2½	40	1	...	1	1	...	3
1	2	38	7		Ditto,		14·8	60	2	7	1	1	...	11
...	...	62	...		Ditto,		...	...	None found.					
15	1	77	3		Ditto,		4·	...	2	1	1	1	1	6
...	...	...	...	...	...	...	7·9	34·2						
...	...	17	3	No statement.	ditto.	ditto.	ditto.	ditto.						ditto.
...	...	17	3											
1	...	18	2											
...	...	17	3											
...	...	18	2											
...	...	18	2											
...	...	18	2											
...	...	20	...											
3	1	16	4											
5	...	20	...											
...	...	...	...	...	...	...	6·25	31·9	...	...	...	...	...	...

6th Series.

RETURN No. 24.

Return showing the No. of inches of Rain registered in the different districts irrigated by the Western Jumna Canal during the years 1865, 1866, 1867.

	Year 1865.													1866.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Dadoopore, ...	1·32	4·32	4·05	0·83	6·01	2·15	9·33	13·29	6·40	...	...	3·82	5·152	1·99	2·44	...	0·72	...	7·11	15·75	11·23	0·97	0·20	...	...	40·35
Karnaul, ...	0·50	1·20	0·2	5·0	0·2	1·3	2·2	12·2	47	...	...	3·58	28·38	1·65	0·8	...	0·2	...	3·22	6·9	4·7	0·2	0·9	...	...	18·51
Delhi, ...	0·3	1·7	...	0·4	1·5	1·11	3·8	11·0	7·0	...	...	...	32·53	1·72	2·3	...	1·0	...	2·5	4·4	1·81	3·5	0·4	...	...	31·85
Rohtuck, ...	0·6	0·7	0·4	3	1·2	0·5	1·1	6·7	1·1	...	...	0·75	13·35	1·34	...	...	0 3	...	0·8	4 7	4·5	0·9	...	...	...	23·61
Hissar, ...	0·5	1·5	0·8	0·4	0·2	0·7	1·5	7·6	6·4	...	...	0·19	21·5	1·9	0·38	...	0·3	...	1·1	2·2	3·3	0·1	0·3	...	...	10 08
TOTAL AVERAGE,	...	...	...	..	...	...	...	...	...	...	...	...	28·25	...	...	...	...	...	...	...	...	...	...	...	...	22·89

RETURN No. 24.—*Concluded.*

	1867.													*Total during rainy season of*		
	January.	February.	March.	April.	May.	June.	July.	August.	September.	Ootober.	November.	December.	Total.	1865.	1866.	1867.
Dadoopore, ...	0·19	0·95	1·07	0·64	1·72	5·69	22·28	20·32	5·27	0·01	...	0 88	59·02	31·17	35·16	53·58
Karnaul, ...	...	...	0·5	0·6	0·9	2·4	7·9	13·1	2·8	...	...	0·6	28·80	20·4	15·02	26·2
Delhi, ...	...	...	0·8	0·7	0·7	0·9	13·7	7·2	1·1	...	...	1·7	26·80	22·8	28·5	22·9
Rohtuck, ...	0·1	...	1·3	1·2	1·0	...	5 0	9·8	2·5	...	...	1·1	22·6	9·4	10·9	17·3
Hissar, ...	...	0·3	0·9	...	0·3	0·9	10·3	7·2	0·4	...	...	0·12	21·5	16·2	7·2	18·8
TOTAL AVERAGE, ...	...	...	...	...	...	...	...	...	...	...	...	...	31·75	19·99	19·33	27·75

RETURN No. 25.

Statement showing times the Canal was closed during 1865, 1866 and 1867.

Years.	*Date and month in which the canal was closed.*		Number of days.	REMARKS.
	From	To		
1865.	12th Jany. 1865.	28th Jany. 1865,	17	Clearance to canal bed.
	31st Ditto,	6th Feby. 1865,	7	
	3rd March, ...	4th March, ...	2	Flood in Sombe river, 7' 0"
	10th May, ...	24th May, ...	15	Silt clearance.
	...	26th August, ...	1	Flood in Sombe river, 7' 6"
	2nd September,	6th September,...	5	Flood in Sombe, Putralla and Jumna rivers.
	13th Ditto,	25th Ditto,	13	
	26th December,	31st December,...	6	Heavy rain.
1866.	1st Jany. 1866,	19th Jany. 1866,	19	Repairs to canal bed.
	28th Ditto,	28th February, ...	32	
	...	22nd June 1866,	1	Heavy rain and flood.
1867.	9th Jany. 1867,	14th Jany. 1867,	6	By request of Executive Engineer Hansie Divn.
	30th April, ...	5th May, ...	6	Silt clearance.
	5th July, ...	12th July, ...	8	Flood in Sombe, Putralla and Jumna rivers.
	...	22nd July, ...	1	
	30th July, ...	31st July, ...	2	Flood and rain. No water received in the Lower Division.
	7th August, ...	14th September,	39	

Memorandum by the Hon'ble the Lieutenant Governor, on Dr. Taylor's Report.

This report bears every evidence of having been prepared with great care and impartiality, and bringing, as it does, the sanitary history of the villages watered from this canal down to April 1868, it is of great value—(1) as admitting of comparison with the state of things existing when Dr. Dempster's Committee reported on them, (2) as showing their present condition, and (3) as affording a standard of comparison for future years.

2. Its chief practical value, however, is necessarily derived from the evidence which it supplies as to existing remediable evils—and the suggestions it contains as to the measures which seem most likely to remedy these. All medical men I believe will agree that in adopting as a test, primarily the existence of spleen, and secondarily the prevalence of malarious types of fever, as urged by Dr. Dempster's Committee, he has taken the only sound basis, on which such enquiries can advantageously be founded—and the diagram supplied by him shews so marked a connexion between these *inter se*, and with the proximity of water to the surface throughout the tract examined by him, as to indicate, as remarked by himself, that the parallelism is almost too perfect and complete to command acceptance as a safe guide—though there can be no doubt, that the table in question faithfully exhibits the results of the separate enquiries made by him in different villages, as recorded by him at the time.

3. This table shows, in the most unmistakeable manner, that there is a distinct and constant relation, quoad the villages treated of in his report, between the prevalence of the above diseases and the vicinity of water in the soil to the surface. But it is quite certain that the latter condition is not, in all localities, attended by the same unfavorable sanitary results. Thus, to give an example, water is so near the surface in the tract called Jírwál in Hushiárpúr, and in that named Darrap in Syálkôt, that it sometimes rises above the surface in springs—while the soil is in consequence necessarily so moist, that sugar-cane of excellent quality is produced in abundance, without artificial irrrigation—yet both these tracts are singularly healthy. It seems therefore impossible to doubt, that the vicinity of water to the surface in the villages examined by Dr. Taylor, which is entirely the result of the presence of the canal; is accompanied by other facts,

also resulting chiefly from the present conditions of the canal, which are the real causes of the unhealthiness now prevailing—while Dr. Taylor's report appears very clearly to show what the principal of these causes are.

4. The causes pointed out by him may fairly be summarized in a general way, as comprised in the list given in the margin. But of all the causes assigned, that marked No. 2, viz. obstruction of the natural drainage by the position of the canals and rájbuhas—is undoubtedly by far the most prominent—in so much that while the other evils are noticed but once or twice, no less than at least 8 instances of this one are given in the report.

1. Jhíls and swamps resulting from the high level of the canal, and percolation thence resulting.
2. Jhíls and swamps formed by obstruction of the natural drainage of the country, resulting from defective alignment of canal and rájbuhas.
3. Similar results ensuing from bunding of channels by zemindars to increase their supply of water.
4. Similar results ensuing from abandonment of all canal channels, on alterations of alignment, until the former shall have been filled or silted up.
5. Similar results ensuing from overflowing of the canals.
6. Conveyance to spots not previously so unhealthy, the drainage from unwholesome swamps, by channels not yet sufficiently capacious or complete to carry the whole past the localities in question.
7. Drenching land, after application of manure and offensive refuse.
8. Over-irrigation, creating morass, especially if accompanied by excessive jungly vegetation, and want of sanitary care.

5. I had hoped that during the year which has elapsed since Dr. Taylor's examination was made, a good deal might have been effected towards the removal of this great source of evil—but nearly all remedial measures are dependent on the carrying out of a general remodelling of the entire irrigation—which is necessarily a large work—and although the whole scheme for the Dehli and Rohtak lines has been sketched out and estimated, and the plans and estimates were shown to the Secretary to the Government of India, in November last; it has not been possible, as yet, to set the work fully in progress. One drain near Dehli approaches completion, but the fact that numerous rájbuhas and channels are crossed by the proposed drainage lines, precludes the completion of the latter, until the former have been re-arranged. The swamps near Kurnál, in like manner, cannot be touched until the new head of the Hánsi branch has been completed—and the precise state of the case, at the present time, will be clearly learned from a memorandum supplied to me by Colonel Gulliver, Chief Engineer of Irrigation; which is printed at pages 3, 4, 5, 6 and 7 of these papers.

6. In addition to the above causes, Dr. Taylor refers in a general way to "increase of irrigation, and excessive rain-fall in tracts where it is ordinarily small." He also notices the enhanced injury to vegetable life, and consequently to the cattle subsisting thereon, which is caused by excess of moisture, where the soil abounds in sulphate of soda—though he does not state whether, in his opinion, the consequent production of "Reh" (or surface inflorescence) increases the unhealthiness resulting from over satura-

tion of the soil.* He shows however, at the same time, how irrigation becomes innocuous, even though delivered at a high level; when carefully managed, and noxious undergrowth prevented, as in the Queen's gardens at Dehli, † which he contrasts with the Sabzi Mandi gardens adjoining, where swamps and rank vegetation are allowed to exist; and much sickliness is the result. Some other special matters are also touched upon in the report, such as the effect of closures of the canal, defective conservancy arrangements, &c., which need not be further alluded to here. And where some villages situated on the "Bángar" or high lands are unhealthy; he attributes this to exhalations from the low saturated lands lying below them.

7. Dr. Taylor, in the 75th para of his report, ascribes to the city of Delhi, a character for healthiness, and freedom from fever and spleen disease. But on this point, Dr. DeRenzy remarks—"We find the native troops there for years back, suffering an exceptionally high admission rate for fever," while "we know so little of the health of the native community, that it is dangerous to venture on any assertion on the subject—but there appears to be no doubt that there is a large amount of intermittent fever in Dehli every year—and last year, although there had not been a drop of rain in the autumn, and very little in the summer; Dr. Penny says that there was a very large amount of fever in every quarter of the station." From this it may be presumed that the average health of the city of Dehli has not been so good as Dr. Taylor's returns have led him to suppose,

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* It may be well if I mention here that the Punjab Sanitary Commissioner, Dr. DeRenzy, who has favored me with some remarks on Dr. Taylor's Reports does not concur in the theory given by Dr. Taylor in his 84th para: for the production of Reh, remarking: "The sulphate of soda, of which the efflorescence chiefly consists, is extremely soluble in water, and being so, the Reh of the *high grounds* is dissolved by the rain-fall and carried in solution to the *low* grounds. If now the dissolving water had a free exit, no harm would arise; the salt would be carried away by the rivers to the great deep; but the obstruction of the natural drainage by the unscientific construction of the canal, prevents its escape and compels it to stagnate. The fluid gradually evaporates under a hot sun, and the saline solution becomes more and more concentrated, and at last the fluid is entirely dissipated, leaving the salts to effloresce on the surface. The salts are not raised out of the soil by canal water as Dr. Taylor supposes. They are found in excess at low levels because the water which dissolves and transports them falls by gravitation from the high grounds to the low. If this exposition of the matter be correct, it is obvious that the cure for the Reh evil is the same as that for the brackish water and miasma-tainted air—namely drainage. Let the salt-carrying water flow away, and all will be well. Remove the obstructions raised in wise Nature's path, and the difficulties will be at an end; and if any ground has become barren, from the bad engineering of the past, the simple remedy is to flood it well with canal water, to redissolve the Reh salts, and then to let the water escape, carrying the salts along with it." I cannot myself, however, think that Dr. DeRenzy's theory is altogether correct—for in places where sulphate of soda abounds, as at Lahore; the surface will frequently be found, after a good shower of rain, covered with the white inflorescence, even in high localities—while the 'Khadir' or alluvial land of the river, not half a mile distant, is almost wholly free from alkaline deposits. No doubt, however, where water impregnated with alkaline salts is carried to low tracts and there stagnates, the results must be highly offensive and injurious.

† Dr. DeRenzy however disputes the correctness of the facts here stated, and observes: "He (Dr. Taylor,) speaks of the neighbourhood of the Queen's gardens as healthy, and the Subzee Mundee as unhealthy—and yet the Missionaries who live near the Queen's gardens have been great sufferers from fever, and the mortuary returns show that intra-mural Dehli is much more unhealthy than extra-mural."

and that the troops and civil station at all events have enjoyed no immunity from fever. With reference also to the remarks made by Dr. Taylor in para 69, that the increased unhealthiness of Hissár, is generally attributed to increased irrigation, Dr. DeRenzy states "I made abstracts last year of Dr. Dempster's tables, to ascertain whether there was any fixed relation between the amount of spleen disease in villages and the area under irrigation. It occurred to me that if spleen disease was caused solely or chiefly by miasma, the amount of the spleen disease ought to be in direct ratio to the miasma-bearing surface. But on analyzing the tables, I found there was no steady relation of the kind. Villages with a very small area of irrigation, were just as subject to spleen disease as those with a large one." This test does not appear to me to be a reliable one, on many accounts—but the fact is worth mentioning.

8. The measures of a general character, which are suggested in the report, as suitable for adoption by the Canal Department are as noted in the margin ;* and all of these are being attended to, so far as circumstances permit, by our Canal officers. A good deal has already been affected by straightening channels, draining, silting, &c., and Dr. Taylor gives a cheering account (para 77) of the improvement which has taken place in villages in the Najjafgarh Jhíl, by the draining operations of late years—but what has hitherto been done, bears undoubtedly but a small proportion to what remains to be done.

* I. Realigning the channels of the canal and rájbuhas, on approved principles.
2. Keeping the above channels, as far as possible, below surface.
3. Preventing zamindárs and cultivators from placing bunds across channels.
4. Surface drainage for emptying jhíls.
5. Subsoil drainage for removing marsh.
6. Filling or silting up existing hollows, old channels &c., in which water lodges.

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* Dr. DeRenzy remarks generally—"There cannot be a second opinion as to the expediency of the remedial measures recommended by Dr. Taylor." But he doubts the necessity for subsoil drainage, and in this it will be seen that Colonel Gulliver concurs with him, for the present at all events. Dr. DeRenzy's words are—"As to the subsoil drainage, I believe it is quite unnecessary. Our parching air will dry the soil fast enough. In England they have to spend millions in subsoil drainage, because the atmosphere at all seasons is so humid that evaporation is very slow; but the Punjab sun drains our soil and subsoil fast enough. We have only to attend to *surface* drainage, and prevent the stagnation of drainage water from Reh-bearing soils."

As regards silting up hollows also, it will be seen that Colonel Gulliver by no means recommends the measure being adopted, without the most careful calculations—and considers drainage the true remedy.

Dr. DeRenzy further remarks, with reference to surface drainage—"Measures are urgently needed to remove excessive moisture from the soil in the districts he (Dr. Taylor,) has reported on." "I would repeat my conviction, that by removing the obstruction caused to the natural drainage of the country by the canal, the evils so well described by Dr. Taylor may be almost entirely removed."

9. The report also notices other remedial measures, as per margin, to which it will be well to draw the attention of the local officers and Municipal and Sanitary Committees. It appears somewhat unaccountable that a prejudice prevails almost universally against drinking canal water—although of its greater relative purity, as compared with that of wells, there can be no doubt, * and it may be hoped that it will not be very difficult to disabuse the people generally of this prejudice.

1. Looking to the wells from which drinking water is supplied to men and cattle.
2. Filling up village ditches and improving conservancy and sanitary arrangements generally.
3. Planting trees to form screens from miasma.
4. Preventing the steeping of fibrous substances in the vicinity of villages.
5. Distributing suitable medicines.
6. Persuading the people to use canal instead of well water, where possible.

10. There is I believe a considerable and increasing number of persons who believe, that even in tracts such as these, sickness results rather from drinking contaminated water, than from malaria existing in the air.† And if their theory were wholly correct, it might be anticipated that in the villages which form the subject of this enquiry, the occurrence of fever and spleen disease might be almost entirely prevented by the use of canal water, which must be available to all. But while believing that great benefit would result from that measure, I cannot anticipate any such result as this—and I do not think it is possible to doubt, in the face of the facts adduced in this report, that noxious and most injurious exhalations arise from over-saturated land. I believe Dr. Taylor to be correct when he attributes the healthiness of Hánsi, as compared with Hissár, to the existence of belts of trees in the former, which ward off these exhalations—and if this be so, it appears strongly to indicate that the fever producing cause is, in some cases at all events, to be found in the air, rather than in the drinking water.

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* In connexion with this matter, however, it will be well to bear in mind the following caution given by Dr. DeRenzy—which although it relates chiefly to cholera, is not altogether out of place here. "There is no doubt," he says, "that *under ordinary circumstances*, canal water is more wholesome than well water, but when cholera is epidemic, and the canal flows through a populous country, the canal water is extremely dangerous. A very important paper came out a few weeks ago, demonstrating very clearly that the Dutch canals have been playing a very important part in the diffusion of cholera in Holland—and in Peshawar, Kohat, Rawalpindi and Dhurmsalla, we have ourselves examples of the mischief a running stream may commit in time of cholera epidemics. But notwithstanding this risk, there should, I think, be no hesitation in recommending the poor people on the Western Jumna Canal to use canal water. Their wells, it is true, might be made wholesome by drainage, but who is to undertake the work? The Government have not the means, and the people have not the knowledge to do it. Some stern measures appear to be necessary to protect water-courses from defilement by dead bodies. The practice of throwing dead bodies into streams is at times a source of great danger to the public health, as Dr. Taylor points out."

† Dr. DeRenzy remarks on this point—"Drainage works promote the purity of water, as much as that of air"—"so that whatever view may be entertained of the mode of the propagation of malaria, the recommendation to drain and dry the soil loses none of its weight. There are indeed many indications in Dr. Taylor's report that the water as well as the air suffers from the excessive moisture of the soil. The wells becoming brackish in so many places shows that the surface salts are carried in solution into the drinking water. Now if the salts of the soil are carried in this way, there can be no doubt that any malaria it may contain must also be carried by the same vehicle—for malaria is beyond all question capable of being held in solution or suspension in water."

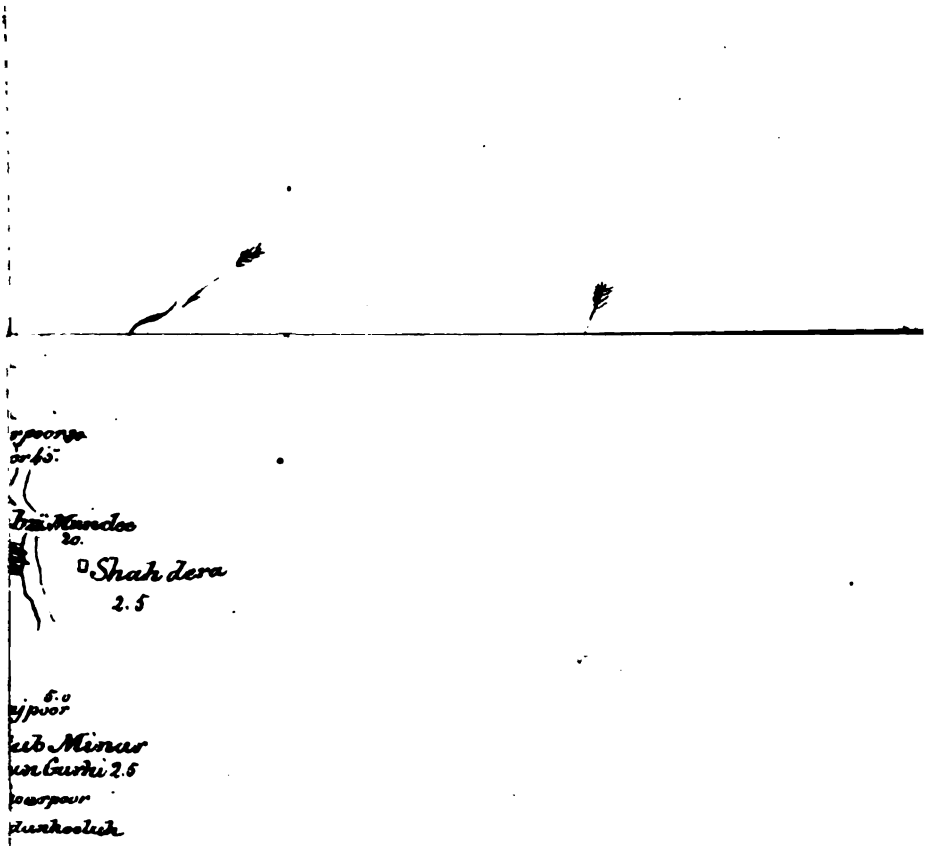
11. It may be well hereafter to bear in mind the suggestion made in para 85 of this report, that where the soil contains alkali in excess ; it may be advisable to plant it largely with the Bábúl tree (Acacia Arabica) which grows in such soils where neither cereals nor grasses will thrive—and that these soils when thoroughly drained, may be greatly improved, if not entirely reclaimed, by manuring and garden culture ; as well as by sowing plants of the salsola tribe. A coarse carbonate of soda is largely produced from these plants in this province—and as they take up the sulphates and chlorides existing in the soil ; it may be presumed that if cultivated continuously, so long as the soil would bear them ; and the carbonate obtained by burning the plants, utilized ; much benefit would ultimately result.

12. In conclusion I would remark that Dr. Taylor deserves, in my opinion, great commendation for the manner in which he has conducted the important duty entrusted to him. He entered upon it with enthusiasm, carried it through with great energy, and has shown much tact in dealing with all with whom he has been brought in contact. The personal examination necessarily involved was calculated to excite much suspicion and opposition on the part of a rude and ignorant population—yet only on one occasion did any complaint reach this Government, and in that instance, it appeared that no real ground of offence had been given. Dr. Taylor has succeeded in drawing up a most interesting and valuable report, and all that now remains necessary, in order to turn it to full account, is that after the proposed remedial measures shall have been fully carried out, and been for some time in force ; a similar enquiry be repeated, in order that it may be seen how far they have proved effective. I think it most desirable that similar enquiries be instituted, in regard to the lands irrigated at present from the Bári Doáb Canal, and those to which it is proposed to extend irrigation from it, as well as to the lands irrigated from Inundation Canals and from hill streams—on which subject I propose addressing Government separately.

D. F. McLEOD,

Lieutenant Governor.

Murree, 31*st July* 1869.



ring level in the various district
mna Canal.