THE

EPIDEMIC FEVER IN BENGAL.

REPRINTED FROM THE HINDOO PATRIOT, 1872-73.

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PREFACE.

Several theories have been, from time to time, started to account for the origin of the fell Epidemic which has, within the last twelve years, devastated some of the finest Districts of Bengal, and to point out the best means of overcoming it. Action has, likewise, been taken in accordance with some of them; but as yet without any avail. The disease is still advancing with rapid strides, spreading misery and death amidst thousands of happy and contented families; and the prospect of the people in the afflicted districts and their neighbourhood, is the gloomiest possible. There appears now to exist an pretty general consensus of opinion as to defecti the drainage being the chief cause of the disease; bu ers owing to differences of opinion as to the seat of om defect, no good has yet resulted, and there is some likelihood of mischief being done by a wrong course of action. The writer of this note thinks it desirable therefore to place before the public, in a convenient form, some articles, originally published in the *Hindoo Patriot*, in which the question has been discussed with special reference to this point, in the hope that they may prove useful in solving a problem which has hitherto appeared so puzzling

The articles were written with a view to defend the position assumed by the Hon'ble Degumber Mitter

in his minute on the subject which was published
an appendix to the Report of the Epidemic Commi
sion of 1861, and to combat adverse opinions as th
presented themselves from time to time, without a
intention of an ulterior publication in a collected for
This has led to some want of unity and condensatio
There are also in them a few repetitions, and an occ
sional acerbity of tone inseparable from newspap
articles of the kind. For the last the writer desir
to express his regret. It is the farthest from h
wish to give offence to those who laboured conscie
tiously in the furtherance of a good cause, thoug
in the interest of truth and humanity, he h
thought fit to differ from them.

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THE EPIDEMIC FEVER IN BENGAL.

I.

We readily admit that according to his light the Lieutenant Governor is doing his best to administer relief in the epidemic districts, though that relief, we venture to think, he must have ere this discovered, is calculated not to restore the sufferer in any one instance to his usual state of health, but simply to enable him to tide over the crisis, and, in some cases, only to prolong for a time a miserable existence; for quinine, the chief remedy administered, though otherwise an admirable prophylactic, is quite powerless in coping with the epidemic fever, and it is questionable whether the sufferers would fare worse without it as regards perfect recovery from the fatal disease. Nothing short of thorough preventive measures, can restore the fever-stricken villages to their former healthy condition, and if, as it appears from the Resolution, published in the *Calcutta Gazette* of the 31st July last, His Honor is satisfied that the generating cause of the epidemic fever still remains undiscovered, and that no preventive measures can therefore be adopted, it would perhaps be better to leave the people to their own resources, than to forfeit the respect they entertain for the superior wisdom of their rulers by the adoption of measures, invariably unsuccessful, and not unoften extremely vexatious. We are, however, disposed to think that amidst the many and distracting cares of his high office His Honor has not yet been able to bestow

sufficient attention to the subject; otherwise it is difficult to account for the desponding view which, he takes, in the Resolution under notice, regardless alike of the facts which have been already collected, and the opinions expressed both by professional and non-professional men as to the probable cause of the disease. A patient study of the history of this momentous question could not fail to impress upon him the fact that, however widely opinion might have differed during the earlier stages of the enquiry, there is a perfect unanimity now amongst all those who have devoted their time and attention to the subject, as to impeded drainage being one of the chief causes, if not the sole exciting cause, of the epidemic fever—an opinion which was for the first time put forth and was most stoutly maintained by one of the members of the Epidemic Commissio appointed in 1864. The medical faculty, do not any longe dispute it; and the following extract from the report of E Payne on the Burdwan fever, dated the 30th December 187 and published in the *Calcutta Gazette* of the 10th Januar last, affords a striking illustration of what duly qualifi persons thought about it:

"A crowded or dirty village here, and poverty and fo drinking water there, may and doubtless do, by predisposi the human system to any taint that may threaten it, a impairing its resistance, determine in some degree the loc features of the disease when it comes; but if such things b held up as the cause of the specific fever, contradiction wil arise in the history of other years when places similarly predisposed were less severely visited, and of other places simultaneously visited with no such predisposing cause. It is necessary to regard the circumstances of the whole tract affected, and to treat such local things as incidental and

capable of influencing only the incidence of the fever among classes and places.

"With this view a cause sufficiently wide and potent is not far to seek. It is one which has already been brought to notice by medical officers, and with peculiar force by Dr. Smith, the Sanitary Commissioner, and one which I venture to think the events of each succeeding year tend more and more to bring into absolute demonstration, viz., the gradual conversion of a well-drained healthy and prosperous tract of country into the condition of Lincolnshire fens of many years ago, with a sub-soil water-lodged and exhaling marsh poisons for the population to absorb."

The argument is irrefragable and conclusive; but we cannot help observing, that it is after all only a confirmation, and a tardy one, of what, with cogent proofs and simple illustrations, was so strongly urged in the appendix to the report of the Epidemic Commission, but which happening to proceed from a layman and not having been subscribed to by the three medical officers composing the Commission, failed unfortunately for the cause of humanity, to command due attention. With every deference to Dr. Payne we must also take leave to question the accuracy of the statement that the only cause which but so lately as December 1871, struck him with the force of a demonstration, as sufficiently accounting for the epidemic, "is one which has already been brought to notice by medical officers, and with peculiar force by Dr. Smith, the Sanitary Commissioner." Defective drainage was doubtless incidentally mentioned as one of the many causes of the epidemic fever both by medical officers and engineers, (*vide* Epidemic Commission's report, the reports of the Sanitary Commissioner, and Mr. Adley's

report on the subject,) but it was never advanced as the sole exciting cause, except by the native member of the Epidemic Commission. In fact it is the indecision of the medical officers, and their enunciation of a hundred and one causes to account for the outbreak, (rank vegetation being held up as the chief,) which have hitherto driven the Government to the adoption of measures, which, without in the least degree checking or abating the epidemic proved to be a new and fruitful source of annoyance and oppression to those already suffering from the ravages of a fell disease.

To afford a convincing proof of our position that medical men never attached much importance to what Dr. Payne would now credit them with, we give the following extract from a minute recorded by Lord Lawrence on the subject:

"The report of the commission appointed in January 1864 by the late Lieutenant Governor to enquire into the causes of the fever, describes the state of the villages to be such as justifies the wonder expressed that the people had not suffered even more extensively, but does not, I am to observe, satisfactorily account for the fact that all the causes of disease mentioned by the commission have been for years at work in many places, which until lately have never suffered, and are still in operation in many places, yet free from sickness. The only new cause suggested by the native member of the commission, Babu Degamber Mitter, as probably increasing the dampness which the commission considered to be the main source of the disease, was the obstruction to drainage by railways and roads and the shutting up of outlets into rivers. Lieutenant Hills of the Public Works Department was accordingly deputed to report fully on the drainage of the country, and to propose

general scheme for its improvement with special reference to Babu Degamber Mitter's suggestion. In his final report, submitted in December 1864,) Lieutenant Hills distinctly asserted that the Eastern Bengal Railway had not affected the drainage, and he especially mentioned some points of importance on which more or less action was taken. The report, however, contained no such comprehensive scheme as had been expected."

It is, however, not to be wondered at that, in accounting for the outbreak of an epidemic fever in a country which is under water for nearly half the year, much stress should not have been laid upon dampness or humidity of the subsoil, which at first sight would naturally strike any man to be its normal condition. "What cares he for the dews of heaven (as the Sanskrit *sloka* has it) who has made the ocean his bed." The truth however, is that Bengal villages are several feet higher than the adjoining country, and that unless naturally or artificially obstructed there is on that account a peculiar facility for their thorough drainage, and this is a fact not likely to strike a foreigner readily: we believe if it has not yet been fully realized even by Doctor Payne himself as we shall show lower down.

Turning to the main question, we believe, we may now safely assume, that Dr. Payne only expresses the general opinion of the profession when, scouting with Lord Lawrence, the idea that the conditions never absent from a Bengal village could have any thing to do with the epidemic fever, he distinctly and unequivocally maintains that it is, as its pathology unmistakeably indicates, impeded drainage, solely which "has converted a well drained, healthy and prosperous tract of country into the condition of the Lincolnshire fens of many years ago, with a sub-soil water-lodged

and exhaling marsh poisons for the population to absor
This condition of the sub-soil, no one will, we vent
to think, deny, can only arise from impeded draina
and the only question for determination, therefore,
what is this impeded drainage owing to? The Engine
with one accord say that it is entirely due to the silting
of some of the Hooghly and Burdwan rivers, which are th
drainage outfall of the districts; and both Doctors Smith an
Payne have acquiesced in their decision. Let us, howeve
examine the drainage system of the country, and see how fa
it will support this opinion. We cannot do this better tha
by quoting the following paragraph from the Appendix
the report of the Epidemic Commission alluded to above:

"The drainage of all the villages in the epidemic districts
as elsewhere in Lower Bengal, is effected by the water firs
running into the nearest paddy fields lying in the direction
of their slope, thence it collects in the *beels* from which i
rushes through *khals* into larger streams, which again com
municate with navigable rivers. An obstruction occurring
in any one of these conduits must interfere with the drainage
and its effects are felt more or less according to the proximi-
ty or remoteness of the obstruction from the scene of its
influence. Accordingly, it has been found, as will be noticed
more particularly hereafter, that the stoppage of the mouths
of the different streams has not been productive of such
serious consequences to the villages lying within their in-
fluence, as when the same occurred more in the vicinity of
those villages."

Assuming the above to be an accurate description of the drainage system of the country, as we have no doubt it is, we must admit that the silting up of the rivers is no doubt calculated to interfere with the drainage of a village

...gly as much as obstructions offered to it at any one ...o ...e intermediate conduits. But what puzzles us very ...ub...h is that as a matter of fact the offence should be laid ...ss...rely at the door of the river, though in obedience to the ...the's, which the drainage of the country must obey, it is evi... imp...t that obstructions might be offered to it, and with more ...eedy and fatal effects, in its passage from the village into ...e paddy-field, from the paddy-field into the *Beel*, and from ... latter again into the khal. Do the Engineers pre... fo...d to say that a sufficiently high, road or embankment is ...ossing any one of these conduits, will not quite effectu... ...ly shut out the drainage of a village or a number of ... w...lages lying on the upper side of the road or embankment, ...iven if the outfall, the river, were perfectly open? And if so, qu...ave not a large number of roads been constructed in both ad...ic affected districts as railway feeders, or as ordinary high... epi...ays during the last fifteen years, not to mention the railway, ...most of them crossing the drainage channels of villages? ...further, have not many important khals, the drainage chan... ...acls of villages, been closed by those roads, unprovided as a ...rule with culverts at the site of those khals? and have not ... many of them been likewise dammed up by the zemindars, ...gnorant of the mischief they were thereby doing, for the ...purpose of retaining water on their rice-fields? None will venture to meet these questions with a negative, and admitting the facts involved in them, to maintain that the drainage of the two districts has been impeded and consequently the sub-soil has become water-clogged by the silting up of the rivers only, would savour very much of a reluctance to adopt in its integrity the theory propounded by the Native member of the Commission. It is nevertheless a fact that while impeded drainage is now acknowledged to be alone sufficient to

account for the epidemic fever, it is contended, substantially though not in so many words, that it has not been occasioned by any other of the different causes assigned by him, but by the silting up of the rivers alone. The fallacy of this assumption however, may be easily proved by references to many instances in which the epidemic fever has broken out and in the most virulent form in villages, whose drainage outfall, *viz.*, the river, is quite in fact. Take for example the case of the continuous line of villages from Ichapur to Chagda, numbering among them such thickly populated places and standing on uncommonly elevated planes, as Halisahur and Kanchrapara. These places are all situated on the eastern bank of the Hooghly, the farthest not being more than 20 miles from Calcutta. The drainage of these villages, until the obstruction offered to it by the Eastern Bengal Railway, obeying the laws so correctly enunciated in another paragraph of the Appendix referred to above, first ran in a direction away from the river on which they stand, but eventually came back to it through the two khals called the Ichapur Khal and Bager Khal. Neither the Hooghly river nor the khals have silted up, and yet the people of all those villages suffered from a severe type of the epidemic fever, which broke out, exactly in the order of time in which the railway embankment progressed and passed along their eastern borders, completely shutting out their drainage from the *Beels* Burrotee and Motheora. Precisely the same might be said of all the epidemic-stricken villages on the other or western side of the River Hooghly, from below Bullagore to Culna. The river is perfectly open and is tidal up to the latter place, and yet a number of villages, some of which

might with propriety be called towns, such as Bullagore, Goop-tipara and Culna, were decimated by the epidemic, from which some of the villages have scarcely yet recovered.

Such instances might be easily multiplied, proving beyond the possibility of a doubt that the silting up of rivers had least to do with the impeded drainage of the epidemic villages. In fact the absurdity of the theory that the epidemic fever in Hooghly and Burdwan is wholly and exclusively due to the silting up of the rivers would, we feel confident, have been quite transparent to its advocates, if, before hazarding it, they had the patience to consider that a general obstruction of that kind to the drainage of a tract of country must have been followed, as its inevitable consequence, by a general outbreak of the disease in all the villages lying within it, and not, as is the fact and as is admitted in all official reports on the subject, by a most capricious and whimsical selection of some of them. Farther, most of the drainage outfalls in the Hooghly and Burdwan districts silt up, or dry up, after the close of the rains, and are opened out again at their commencement in the succeeding year; so practically there is no impediment offered through their agency to the drainage of the country. We may as well here explain what we mean by the drainage of the country, as we regret to observe, there is a great deal of misconception existing on that point, leading to most erroneous conclusions.

The whole of the Gangetic delta may not inaptly be described as one swampy expanse, interspersed, at varying intervals, with villages several feet higher than the surrounding country. The surrounding country is inundated more or less during the rains; but not so the majority of the villages, the sites for which, where practicable, have been so selected

as to be beyond the reach of the ordinary annual inundation. As a matter, course, therefore, the periodical rains, unless obstructed in their course, run off from the surface of the villages in the direction of their slope into the adjoining low country. The drainage of the low parts again, viz., of its arable lands, passes through khals into different outfalls. The water-levels of the khals and of rivers are, as a rule, so adjusted that it is the villages only, and not the surrounding country, that are completely drained during the rains. There is always a quantity of water left on the Sali arable lands, which constitute three-fourths of the total area of Lower Bengal. Where such lands are not so situated as to retain some water, recourse is had to embankment for the purpose of retaining it. The lands liable to annual submersion are used for the cultivation of the different varieties of amun paddy, the staple food of the country; they are utterly unfit for the production of all other crops from the circumstance of their being from 2 to 16 feet under water during the rains. With the close of the rains the rivers begin to fall, and the country to be drained of the water hitherto over-spreading its surface, and contributing to the healthy growth and the bringing to maturity of the paddy crop.

By the end of October, when water is no longer needed for the rice crop, the country is completely drained of the monsoon water from over its surface, except where the lands especially low, as in the case of *Beels*. Some of the latter, or portions of them, are never dry, though most of them dry up completely between January and March. It would be futile to deny that, owing to the periodical rains and the low and swampy condition of the lands, the country is always unhealthy in the rainy season, but strange; to say it is more so at its close

than during its continuance,—that is the people are more sickly when the water which covered its surface has drained off but left the soil more or less moist, than when it covered the face of the country.

This unhealthiness is, however, the normal condition of the country, which it is as idle to think of escaping from, as from the scorching sun of April and May. What we are concerned with is the intervention of the abnormal condition, which has intensified the normal unhealthiness to a dreadfully fatal epidemic. This abnormal condition is not to be looked for in the marshy character of the surrounding country, which is ever present, but in that of the villages themselves, the drainage of which, has been interfered with. We also find as a matter of fact that the paddy fields, marshy as they are, may be rendered unusually unhealthy and at the same time totally non-productive by impediment offered, in the manner described above, to the measure of drainage which they ordinarily enjoy. A paddy field from the surface of which the monsoon water does not retire nor dry up before April, will never yield a remunerative crop.

It should be borne in mind that when we talk of the drainage of the country, we do not mean the *complete* drainage of its arable lands or of the villages, which, owing to the physical peculiarities of the country, is simply impossible, but of such drainage only as they respectively normally enjoy. This distinction is not closely kept in view when the engineers talk of the *Jheels*, *Jullas* and the paddy fields of the country as being concerned in the propagation of the epidemic fever, or when the doctors support that opinion, because they perceive the country is "in the condition of Lincolnshire fens of many years ago." Now, as a matter

of fact we do not know that any part of Hooghly or Burdwan has become more fenny now and on that account non-productive than it was ever before, though we can safely testify to the epidemic villages having become sensibly more damp than they ever were; and if, as Mr. Adley, the Engineer, seriously maintains (*vide* his report dated 25th June 1869) that the salvation of the country depends on the Jheels and Jullahs with which it is thickly interspersed, being completely drained, and a belt of trees planted round villages, lying amidst rice lands, (which opinion seems to have found favor with Government as the Act for the reclamation of the *Dancoona Julla* in the district of Hooghly passed by the Bengal Council last year would indicate) we may as well despair of ever ridding the country of the epidemic fever, inasmuch as the reclamation of *Jheels* and *Jullas* in Lower Bengal means a thorough change in the physical aspect of the country.

II.

It is observable that while Mr. Adley, having regard to the type of the fever indicating its malarious origin, could not with any show of reason refuse a place to water-lodged sub-soil among the one and thirty causes to which he traces the disease, and while Dr. Payne, with a better knowledge of the pathogeny of the fever, rejects the idea of any other but a water-lodged sub-soil being the only exciting cause, neither of them has sought for its presence in the right place. There can be no doubt as to the abnormal humidity of the sub-soil being at the root of the epidemic, but we respectfully maintain, in direct opposition of the learned doctor and the experienced engineer, that it is not the *sub-soil* of

the *jheels* and paddy fields that is to be looked to for its proximate and exciting cause, but that of the epidemic-stricken villages themselves—that the malarious poison which has contaminated the air and engendered the epidemic fever, is not what is evolved from the sub-soil of the jheels and paddy lands, but that of the villages, which, though at one time well-drained and dry, have been converted (in the language of Dr. Payne, though not used in reference to villages) "into the condition of Lincolnshire fens of many years ago with a sub-soil water-lodged and exhaling marsh poisons for the population to absorb." To explain our views more fully, and trace the "water-clogged sub-soil" to its proper site we will make another extract from the appendix to the report of the Epidemic Commission. The paragraph we quote follows a detailed statement of the manner in which the drainage of the fever-stricken villages appeared to the native member of the Commission to have been obstructed :

"I may here remark that the face of the country being perfecty flat, the drainage runs over the whole surface towards the direction of its slope, and consequently roads running transversely to it must of necessity intercept the drainage. Both the East Indian and Eastern Bengal Railways are provided with capacious viaducts wherever they have crossed what appeared to the eye as water-courses, but these are in reality khals and other large streams, which, as I have already observed, received the drainage in its flow from the villages over paddy-fields and bheels. The latter (paddy-fields and bheels) exhibit no visible signs of their being water-ways, and could not be known as such unless narrowly watched during the rains, though a road crossing them would more effectually shut out the drainage, and the

evil consequences resulting therefrom would be much sooner felt, than when it crossed distant channels. Taking into consideration the number of roads which have sprung up of late, as also others in course of construction, and bearing in mind, likewise, the manner in which the drainage of the country is effected, and the difficulty thereby entailed of providing those roads with a sufficient number of outlets, it is not improbable that in the case of those villages which have not yet been examined obstructions to their drainage would, upon enquiry, appear to have proceeded chiefly from roads having been made without reference to the drainage level of the country, and without being provided with a sufficient number of water-courses."

Without denying, as a matter of theory, that the silting up of a river in this country would interfere with the drainage of some tract of it, we are decidedly of opinion that it is the water-clogged sub-soil of villages, consequent upon impeded drainage that has mainly contributed to the generation of the miasmatic poison, which has resulted in the outbreak of the epidemic fever in them. The extreme dampness which the houses in the epidemic-stricken villages present—houses which were heretofore noted for their dryness —and the disappearance or stunted growth of such of the vegetable species, as are partial to a dry soil (*assaura* and the like), and the luxuriant growth of others habitually fond of a moist soil (such as Belati Bharanda), are, we think, unmistakeable evidences of the fact, and we fully agree in the statement quoted above that the mischief has been committed chiefly by roads, railways and embankments, not because as such, but because they have happened to cross the drainage levels of villages. In many instances the mischief has been likewise done by the khals or other natural channels

of drainage having been dammed up by zemindars or their ryots for purposes of fishery, or for retaining monsoon water on their comparatively elevated rice lands, which otherwise would be unproductive. This practice of damming up khals, is resorted to, as well, for the purpose of keeping out water when the lands are excessively low, and when, in consequence, there is fear of the crop suffering from too much moisture. The appendix quoted above adduces a good many instances in support of this view, and we are in a position to supplement them by recording the following as the result of enquiries we have lately caused to be made by a competent and reliable person whom we had taken considerable pains to train up for the purpose.

The sub-divisional town of Jehanabad, in the district of Hooghly, is situated on the eastern bank of the Dwarkessore river. Its drainage, following the laws we have already explained, flowed into the paddy-field lying to the north-east of the town, whence a part of it used to find exit through two khals into the Kana Nudee, but the major portion, after passing over the paddy-fields collected in the Byra Julla, and thence discharged into the Kana-Nudee through Gurbari Khal. This khal, pursuing a serpentine course, traverses a large tract of country, and, receiving the drainage of a large number of other villages, besides that of Jehanabad, opens into the Kana Nudee at a place called Gopinathpore. Its mouth was closed by the zemindar, through whose property it passed, in the Bengali year 1273 (A. D. 1866-67) for the purpose of retaining water on the rice lands, which are very high, and from which the monsoon water ran off into the khal. This closure helped to keep the khal full, and at the same time rendered it incapable of receiving the drainage

from the paddy fields, and the latter on their turn failed to draw water from the villages of which they were the drainage media. This lock up was followed by the outbreak of an epidemic almost simultaneously in all the villages of which the khal was the drainage outlet;—in a mitigated form in the year immediately succeeding the one in which the khal was closed, and virulently the year after. The following are the names of some of the many villages which have suffered from the closure of this khal—Jehanabad, Parool, Mohespore, Gurbari, Dehi, Byra Joyrampore, and Gopinathpore.

In the same tract of country, and for precisely the same purpose, another stream, called Koko Nuddee, which was the drainage channel of a large number of villages, and which likewise emptied itself into the Kana Nuddee, was similarly closed at its mouth at Dhurrumpota in the same year, viz., 1866-67, and the same was followed shortly after by an outbreak of the epidemic fever in a number of villages, such as Kanpore, Sonagatchee, Kistohatee, Satpore, Shamdossbattee Ranhat, Hamirbatee, Pyra Dhurrempore &c., &c., &c. We should here mention that the cross dam over this khal is provided with an apology for a sluice which is so adjusted as to let out the water only when the Khal is full to overflowing and when the crop of the adjoining fields is likely to suffer from excess of moisture. This of course does not help the drainage of the villages, inasmuch as the whole of this tract, is very high, and the villages situated therein are not much higher than the surrounding paddy fields. The consequence is that the Khal and the paddy fields, being kept full, do not draw the drainage from the adjoining villages, and the lands remain preternaturally moist.

In the same Sub-Division and for the same purpose, the Jalalpore, Tamlabona, Arakool, Satmasha, Ryepore and Girgatolla Khals, all emptying into the Kana Nuddee, were closed,—the first four about six, and the two last four, years ago,—and the result was an outbreak of the epidemic fever in all the villages of which they were the drainage outlets. The names of some of the villages are as follow: Madhubpore, Arandi, Pertaupnagore, Arakool, Satmasha, Seepulpore, Poora, Hyatpore and Raepore. We understand that one of these Khals, viz., Girgatolla, has given way lately, the pressure of water from within being too strong to be resisted by the dam which had closed it; thus a successful effort of nature has accomplished for the villages whose drainage had been hitherto impeded, what we of late repeatedly, but vainly, importuned the Magistrate of Hooghly to do in the interest of those and a host of other villages in the Sub-Division of Jehanabad.

In the same Sub-Division a kutcha road was constructed between the years 1275, and 1276 (A. D. 1868-69) meeting the grand trunk road at Myapore, and extending to Khanakool, crossing in its course the drainage channels of many villages, and thereby intercepting their flow into the Kana Nuddee. This resulted in the breaking out of an epidemic in all the villages, whose drainage was thereby obstructed. The disease appeared in a mild form in 1870, but assumed a virulent type in the succeeding year. The following are the names of some of the villages, which are indebted to the road for this first blessing brought in its train, to wit, Khullutpore, Saota, Tanksabee, Gourang, Syebona, Langoolpara, Rughoonathpore, Kistanagore, Gopalnagore, Naraunpore, and Khanakool.

In our issue of the 5th ultimo we gave in great detail the last mentioned case, and solicited the authorities to

open out the khals, and thereby restore the drainage of all the villages which had been affected by the road in question. Our excuse for having been so importunate in the matter, was the circumstance that the epidemic fever, which disappears or abates with the setting in of the hot weather to reappear at the close of the rains, might, we fondly believed, be prevented from again making its appearance in those villages by the timely adoption of the precautionary measures we had taken the liberty to suggest. Our recommendation, however, not being one of chivalrous raid against shrubs and herbs, nor of enmity against receptacles of water in poor people's compounds, nor of annihilation of *pana* in old tanks nor of any one of a hundred and one things, which readily address themselves to the senses, and are therefore seized upon with avidity by our officials, was not at all heeded, and it is now our painful duty to state that the fever has already made its appearance in many of those villages, and in a still more virulent form than in the previous year.

We are, however, glad to find that our article on the subject has been approvingly reproduced in the last number of the *Indian Medical Gazette* with the following pertinent remarks by the Editor. "It would be interesting to learn whether other villages similarly circumstanced have *not* been visited by the fever, and whether places differently circumstanced have. It is only from particular observations of an exact kind that sound conclusions can flow." We readily adopt this wise suggestion, and have much pleasure to supply the omission by offering the following facts. The road which has caused the obstruction to the drainage, extends, as we have before mentioned, as far as Khanacool. Beyond it are situated, on the same side of the Kana Nuddee,

the villages of Obidpur, Odoypur, Katadana and Ujodhya. The country in the midst of which these villages are situate, is particularly low and marshy, so much so that it is only in years of drought that the agriculturists obtain any crop therefrom, and yet the villages are quite free from the epidemic. The condition of the Kana Nuddee, again, is precisely the same in respect of these as of the neighbouring epidemic-stricken villages. The only difference which would strike any sensible man between the circumstances of the two lines of villages respectively, is that the road which crosses the drainage level of the latter does not extend to the former. The conclusion is, therefore, irresistible that their freedom from the epidemic is either attributable to their fortunate escape from the presence of the road, or their situation amidst a tract of country much more marshy than that of epidemic villages. We need not take time to consider which of the two to choose.

It will be thus seen that places, otherwise similarly situated or rather more favorably situated for the propagation of the epidemic, have nevertheless escaped it, only because the road has not extended into them, and their drainage has not been interfered with. As for facts tending to show that places, in every respect similarly circumstanced, have yet escaped from the consequences thereof, we are not aware of any ; nor, in our opinion, is such a contingency possible ; when it is our firm belief, induced after a careful analysis of a number of facts collected during the last ten years, firstly, that the type of fever met with in the epidemic districts is solely due to something in the soil—and the condition most favorable to the development of *that* something, is excessive or abnormal humidity of the sub-soil ; secondly, that when such a state of the sub-soil is not

the normal condition (in some places excessive humidity is natural, owing to the extreme porousness or some other peculiarity of the soil, as in the case of almost the whole district of Rungpore, where consequently this type of fever rages endemically) the cause which operates most powerfully to produce that condition is impeded drainage; and thirdly, that it is the inordinate humidity of the sub-soil of towns and villages, and not of the paddy fields and jullas, which contributes to the outbreak of the fever with epidemic intensity. Strange as it may appear, it is none the less true, that the fact, that the natural drainage of a Bengal town cannot with impunity be interfered with, which of all others should have forced itself generally into notice, is yet just the one least generally known or recognized—and it is to this ignorance or indifference, that is to be attributed, the ruin of many flourishing cities and towns both in earlier and later times. In a footnote to the Appendix so often referred to, we find the following: "It is highly probable that the long continued pestilence which necessitated the removal of the seat of Government from Gour to Toura, was caused by the interruption in the drainage of that city. The heavy embankment on the margin of the lake or *bheel* on its eastern extremity, which guarded the city from inundation, must have effectually shut out the drainage in its flow into the lake."

"That the theory advanced in the above, to account for the pestilence which depopulated Gour about 300 years ago, has some cogent argument in its favor will appear from the following facts. Gour was situated on the eastern bank of the Ganges. Any one who has seen the interesting ruins of that once magnificent city, must have noticed the remains of a stupendous earthen embankment (not a stone one as stated in

Marshman's History of Bengal) which once encompassed it on all sides—and the maintenance of which had been rendered necessary for the protection of the city from the annual inundations, to which the whole of that tract of country was, and is still, exposed, and not for the purpose of defending it from the encroachment of the river as is erroneously supposed by the same author. Its situation on the eastern bank of the river, at once indicates that its drainage-level must have had an easterly direction—while the presence of a Beel on its eastern borders, as shown in Rennell's map of Gour, is a sure evidence that the drainage of the city found its way into that Beel. As the city was embanked on all sides, its drainage must have passed into the Beel through sluices constructed in the eastern line of the embankment. To preserve intact the drainage of such a low-lying city, and at the same time to protect it from inundation must have been a problem of no little complexity in those days; and it is not at all unlikely that during the sudden and heavy rise of water in the Beel, not unusual in that part of the Gangetic valley, immense volumes of water rushed from time to time into the city through the sluice gates kept open to let out the drainage. It is not unlikely also that the rush of water on such occasions, now and then swept away parts of the embankment, and with it the drainage works, exposing the city to inundation. Indeed, this supposition is fully confirmed by the following statement in the Ain Akbary: "Here is a fine fort, to the eastward of which is a large lake, Chuttephuttea, in which are many islands. If the dams break during the heavy periodical rains, the city is laid under water." Nothing is more probable than that in the degenerate days of the Gour administration, the all-important question of the

drainage of the city had, under the circumstance, been entirely lost sight of, in the all-absorbing thought of how most effectually to guard the city from the ravages of inundation—and it was, we believe, with that view that another line of embankment (mention of which we remember to have seen somewhere which we cannot at present recollect,) was constructed on the borders of the lake. This completely intercepting the drainage of the city, resulted in the outbreak of the epidemic fever, which in a few years completely depopulated it. The type of fever which committed this frightful havoc, is the same which we now find raging in the epidemic districts, with its inseparable and unmistakeable sequelæ, the tumid abdomen, and enlarged spleen, and from which it is said even the domestic animals were not exempt."

In later days the once famous English settlement of Cossimbazar, the Dutch settlement of Kalkapore, and the French settlement of Furrasdanga, with many other neighbouring villages, were most probably depopulated under similar circumstances. The native Member of the Epidemic Commission, described from his personal knowledge, the extreme dampness which those places still presented, and ascribed it, almost instinctively, to impeded drainage; though he was evidently not then quite certain as to what had caused the impediment. The following facts will, however, throw considerable light on the subject. Cossimbazar, Choonakhally and Bhatpara, now thrown inland, were at one time situated on the left bank of the river Hooghly. Their drainage level consequently must have been towards the east, for it should be carefully borne in mind that the banks of rivers are always higher than the surrounding country, or in other words the country always slopes away from a river, and not towards it, and the location of a Beel.

called Solon Beel, further to the east, unmistakeably points that the drainage of those places must at one time have found its way into that Beel. A pucka road, starting from the city of Moorshedabad, passed through this tract of country, completely cutting off those places from their drainage outlet, the Beel in question. Not knowing the exact date when the road was constructed, or the exact year the epidemic broke out in those places, we cannot with certainty, as in the instances of recent occurrence we have mentioned above, connect the one with the other as cause and effect; but the similitude in all important features between the Cossimbazar case, and those occurring in the epidemic districts of Hooghly and Burdwan, is such as scarcely to admit of a doubt that it was the impediment to drainage offered by the road in question which brought on the epidemic. It is remarkable that the adjoining villages lying on the east side of the road, such as Madapore, Tarakpore &c., &c., were never attacked by the epidemic, and are to this day quite free from it.

As regards the Dutch and the French Settlements of Kalkapore and Furrasdanga, those places are also situated on the same side of the river with Cossimbazar, and in a continuous line with it. The presence of a Beel, called Bistopore or Kalkapore Beel, to their south-east plainly attests that the drainage of those places must at one time have passed into it, while that of a pucca road between the Beel and the towns and of another between the Beel and its natural outfall the Gobra Nalah likewise attest how completely the drainage of those places had been, and is still, intercepted by those roads. All these places are still in existence, with the same type of fever prevailing in them, though the disease is not so fatal to the residents as to new comers.

Adjoining Furrasdanga, to the south, are situated, in a continuous line, the famous town of Syedabad, the old settlement of the Armenians, Khagra, the native town of Berhampore, famous for its brass cups and plates, and the cantonment of Berhampore itself. All these places drained themselves into the above named Beal Bistopore—the last through a series of tanks. In all these places, fever of the malarious and intermittent type have prevailed endemically since the last 50 or 60 years, though never in that virulent form which caused the utter depopulation of Cossimbazar, Kalkapore, Furrusdanga, Choonakhally and Bhatpara. The cause of this chronic unhealthiness is not far to seek. Beal Bistopore, which is the drainage receptacle of all these places, like Beels Chaltia, Chandor and Bhoula lying to the south and south-east of it, emptied itself through Gobra Nalla into the Jellenghee until an embanked Pucca road from the city of Moorshedabad to the cantonment of Berhampore, constructed some 50 or 60 years ago completely cut off its communication with this Nalla or Channel, and converted it into a lake without communication with any outfall. As is naturally to be expected from such a state of things, the Beel becomes quite full after a few heavy showers of rain at the commencement of the monsoons, when having no outlet for its overflow it refuses to receive the surface drainage from the above named places, and the water consequently is absorbed in their subsoil. Hence it is that the unhealthiness of these places every year after the close of the rains, bears a direct ratio to the rainfall for the year. It is true enough that there are two sluices constructed in the embankment which protect Berhampore from the inundations of the Bhagiruthi, and are evidently designed to carry off the overflow of the Beel

into that river, but it so happens that during the monsoons the water-level of the Bhagiruthi is higher than that of the Beel, consequently the sluices do not answer the object for which they were designed. It is to us unaccountable that these simple facts have never been noticed, and the drainage of the places have not been restored. This restoration can be accomplished easily, and at no great expense, simply by restoring communication of the Beel with the Gobra Nalla by means of a sufficiently wide and deep drain. Though belonging neither to the profession of medicine, nor of engineering, yet we can safely guarantee the recovery, by the places named, of their original healthiness if our simple suggestion be adopted. The improvement, we warrant, will follow within two years of the completion of the proposed drain.

We will conclude these remarks for the present by giving an instance of how an important town has partially recovered by the partial restoration of its natural drainage. On the south and west of the river Bhoirub is situated the town of Jessore with its drainage receptacle, the Beel Harina lying to the south-west of it. A road, called the Dacca road, constructed, it is said, about 60 years ago, runs along its south and western boundaries, intercepting the drainage of the town in its way to the Beel. How unhealthy Jessore has been for a long course of years is well known. Although we cannot ascertain the exact year in which the above road was constructed, yet we make ourselves bold enough to say that the unhealthiness in question dates within a year or two of the construction of the road. The correct information on the subject cannot, however, be unvailable to the Public Works Department, and we shall be glad to stand corrected in the matter. Cholera is said to have been first introduced into this country from Jessore, and its hand-maid, the malarious

epidemic fever, after committing a frightful havoc about fifty years ago, settled down in Jessore endemically as in Cossimbazar and its neighbourhood. Not a soul could be met with there who had not a sickly tumid belly and lanky extremities to present. All the laws of sanitation known to the authorities from the filling up of holes and dirty tanks to the cutting up of jungle, had been experimented upon, and exhausted. So much so that, with the exception of a few cocoanut trees, not a single old tree of any kind could be met with in the place within a few years of the breaking out of the disease. The natural drainage course of the place, when intercepted by the intervention of the road in question, had been attempted to be diverted towards the river on which the town is situated, but ineffectually, as the river was not tidal there, and was so constantly full to overflowing during the rains, that, instead of receiving the drainage, it would very often inundate a portion of the town itself. Thus a new evil was brought on and the authorities, leaving aside the question of sanitation, had to direct their attention as to how to protect the town from inundation. Towards the latter end two drains were caused to be excavated, running parallel to, and at some distance from, each other, and connecting the river Bhoirub with Beel Harina, thereby affording a vent to the overflow of the river into the Beel. But the drains, in their course to the Bill, passed through the town, and thus the natural drainage of the place which had been obstructed by the Dacca road was accidentally, though as yet partially, restored. The immediate consequence was a considerable improvement in the sanitary condition of the town which has lasted ever since. No one that we are aware of has noticed this; and there may be persons disposed to attribute the improvement to tank-filling, jungle-cutting, and

other forms of folly and extravagance which have acquired such unenviable notoriety of late. The improvement, however, will be only complete when the drainage channels of the place, which are yet directed towards the river, are diverted to the two drains.

III.

To return to the epidemic districts of Hooghly and Burdwan. From what has been already stated it is clear that, so far as the Sub-Division of Jehanabad is concerned, the epidemic first broke out in the comparatively dry and elevated tract, on which are situated the town of Jehanabad and a number of other villages. Two years after, it took an easterly and south-easterly course, and showed itself in villages lying in a much lower tract of country. We are afraid that facts such as these, which are always prominently put forward as important discoveries concerning the character and progress of the epidemic, and made the most of in official reports, have been seized upon by the Lieutenant Governor to help him to the conclusions embodied in the Resolution quoted in our first article on this subject. "These facts," says His Honor, "seemed to suggest that the disease is not in the soil, or in the water, but in some way unknown marches from place to place, not sparing localities least open to sanitary objections."

With every deference to his Honor we cannot help observing, that remarks like the above only tend to show that this momentous question has not received that share of his attention which its importance unquestionably demanded. If His Honor had studied the question at all, he could not have been ignorant of the fact that, though travelling, the fever is never unaccompanied with such com-

panions as ague, and enlarged spleen, both unmistakeably pointing to its malarious origin. It does not, we cannot help saying, speak much in favor of His Honor's powers of observation, or his knowledge of the simplest truths of the medical science, if in opposition to the unanimous verdict of scientific men of all ages and countries, he should still maintain that fever of the type raging in the epidemic districts of Bengal, is not born of the soil.

We believe we have mentioned a sufficient number of facts, the accuracy of which can be easily tested by any one interested in the correct solution of the question, showing, at any rate, the remarkable coincidence between the impediment offered to the surface drainage of the villages, and the outbreak of the epidemic fever therein. When we find, again, that such coincidence is not in conflict with the deductions of science, but, on the contrary, quite in conformity with them, it will be taxing our scepticism too much to regard such coincidence otherwise than in the relation of cause and effect. We should, however, like very much to be in possession of a sufficient number of facts whereby to prove inversely the correctness of the theory we have adopted, viz., facts tending to prove the disappearance of the epidemic from the villages with the removal of the impediment offered to their drainage. But this, we regret, we are not in a position to do, simply because Government has never thought it worth its while to try the efficacy of the suggestions offered in the Appendix to the report of the Epidemic Commission. We will, however, quote the only instance in which they were adopted, and with what result. It occurs in the following letter from Mr. Montressor, Commissioner of the Burdwan Division, to the Government of Bengal, dated the 29th November 1864, and published

in the *Calcutta Gazette* of the 20th December of that year.

"I have the honor to acknowledge the receipt of your letter No. 4274, of the 17th ultimo, with annexure, and, in reply, beg to report that, in consequence of the opinion given by Baboo Degumber Mitter, a Member of the Epidemic Commission, in a Memorandum appended to the report to the Commission, that the virulence of the Epidemic in Dwarbasiny was due to the obstruction of the drainage of a large Jheel to the north-east of that village, a drain was cut during the past hot weather, at an expense of about Rs 120 to convey the water that would otherwise have stagnated in the Jheel, into a large khal which runs into the Kadermutty River; while three pucka culverts were also constructed on the Hooghly road which obstructed the drainage of the Jheel, to enable the water to drain through to the lower grounds on the other side. The total expense incurred was Rupees 313-4-6.

"Baboo Joykissen Mookerjee, zemindar of the village, exercised a general supervision over the work. He considered that the quantity of water that would remain in the hollow centre of the Jheel after a large quantity had been carried off to the river would afford the inhabitants the means of irrigating their lands. The water that would collect in the centre of the Jheel, it was surmised, would not dry up, and no moist surface would be exposed to the rays of the sun.

"The benefit that has resulted from these improvements in drainage, though unquestionable, has not been such as to induce me to attribute to defective drainage alone the prevalence of sickness in Dwarbasiny. A decided improvement in the health of the villagers is reported by Baboo Joykissen Mookerjee to have taken place. There has been no fresh

appearance of disease during the present year, and the only sufferers are those labouring under old fever, or enlargement of the spleen induced by chronic disease. This state of things is to be attributed, partly to ordinary sanitary measures adopted in Dwarbashiny, as well as to a greater precaution being taken by villagers in regard to their food, drinking water, and clothing."

It is much to be regretted that Mr. Montressor, while acknowledging fully the success of the experiment, should nevertheless have marred its effect in the estimation of Government, by attributing the result obtained, partly to sanitary measures initiated under his auspices, which measures, however, consisted simply of the cutting and clearing of jungles,—measures pursued with equal vigor in all the epidemic villages, but with what success the repeated reports of the officers entrusted with the work fully disclose. His remarks about greater precaution having been taken by the people of Dwarbashiny, mostly or wholly poor agriculturists, about their food and clothing, are truly refreshing, and serve to illustrate how a European, spending his life in India, and amidst Indians, may yet know so little about them. Fancy a *chassa*, who, in full vigour and occupation, can earn barely enough to have for clothing a rag round his loins, and for his food two meals of rice, seasoned with a little salt, and some sort of greens, taking to meat diet and woollen garment, when emaciated to a skeleton, and reduced to the last stage of destitution by a deadly epidemic; and yet that is precisely the impression which the remarks of Mr. Montressor are calculated to produce. We must, nevertheless, give that gentleman the credit of being the only one who had the boldness to obey the dictates of common sense in opposition to the voice of science as it then found utterance

through the medical faculty of Bengal. Strange to say that while the experiment which resulted in such a signal success, was not considered worthy of repetition in a single instance, the raid against jungle plants and trees, as the sovereign panacea, was pursued with unremitting vigour year after year, and the officers engaged in the work, thought they were only discharging a duty, though a most painful one, when they had to drag men, prostrated by fever, from their sick bed, to remove the jungle from their homestead, and with it, not unfrequently, their sole means of subsistence, inasmuch as the bamboo tufts and mangoe topes were then construed to be jungle;—a work, upon which, the officers conscientiously believed, depended the salvation of the Bengal villages. Indeed, such was the fatuity with which the Government of Bengal was seized, that, even so late as 1868, the all-absorbing thought was, how best to accomplish this task set by the medical faculty of keeping the pot with a thousand apertures, always full to the brim, as the following extract from a letter of the Government of Bengal to that of India, dated 16th January 1868, will show:

"It must specially be borne in mind that under the conditions of Lower Bengal, any clearance of spontaneous vegetation, however thorough, is of the most transient effect only. To cut down the jungle and under-wood is worse than useless; to root it up is extremely laborious and costly; and even when uprooted it is replaced by a no less luxuriant growth in the course of one or two rainy seasons, so that the question is not one of thoroughly clearing the villages once for all. To be effectual, active and organized measures must be continuous."

So that while village after village was being depopulated by this fatal epidemic, Government was ceaselessly engaged in

this work of wholesale destruction of fact under the uphonious name of jungle-cutting, though no good was ever reported by any officer to have resulted from it, and though the country rang with condemnation of what the people considered to be not only useless, but positively mischievous, as calculated to denude the villages of what their common sense dictated to be a wise provision of nature for the absorption of the malarious poison which they (the villages) must abundantly exhale, even in their normal condition. The only notice taken by the Government during this busy period of the conclusions arrived at by the native member of the Epidemic Commission after a careful analysis of the facts collected with much labour and at great sacrifice of time, was a call upon a young engineer to report whether the drainage of the villages in which the epidemic was raging, had been interrupted in the manner stated in the Appendix to the report of the Epidemic Commission. This officer, in the extract quoted above from the minute of Lord Lawrence, distinctly asserted in the report which he submitted in December 1864 "that the Eastern Bengal Railway had not affected the drainage."

We should have been really surprised even if a lay man had given such an opinion upon inquiry made on the subject simply with the light of common sense; but we are at a loss for words to express sufficiently our wonder at finding this conclusion deliberately arrived at by a professional man, and it is no whit lessened when we observe, that it has been coolly accepted by men who, from their long residence in the country, should have known its physical character sufficiently, to detect at once its absurdity. Any man of ordinary information must know that the river bank in all deltaic formations

being necessarily high, the slope of cities and towns situate upon it, must be towards inland, *i. e.*, in a direction away from the river. It must be also evident to the most ordinary understanding that the country being flat, the drainage must run over the whole surface towards the direction of the slope. And if there is a beel, or depression, in that direction, as is generally the case, it will collect there before discharging into its natural outfall. Under such a state of things any embankment running between such places and the beel must of necessity intercept the drainage of the former in its flow into the latter, unless the embankments were provided with culverts at short intervals, and the drainage of the localities conveyed by means of a number of lateral drains into those culverts. Now it is as plain as a pikesstaff, that the Eastern Bengal Railway has exactly had the effect of such an embankment, running, as it does, between Hallisahar, Kanchrapara, Chagda and many other intermediate places,—all, so situated as to have the river Hooghly, on the one side, and the Beels Burrottee and Mothoora on the other. None dares urge that the section of the railway in question lying between Hallisahar and Chagda, is furnished with culverts at short intervals, or that the drainage of the above villages is made to flow towards those culverts, and yet the engineer gave his dictum "that the Eastern Bengal Railway had not effected the drainage."

But this is not the only instance in connexion with this question in which the credulity of Government was similarly tested. When a great cry was raised in the country for wantonly neglecting the only preventive measure which could effectually check such frightful loss of life in the epidemic villages, Government deputed another engineer to

conduct the same enquiries. As regards the Eastern Bengal Railway, this gentleman reported, that it could not have intercepted the drainage of the places mentioned above, inasmuch as he had frequently passed over that road, but had never seen a heading of water at the village side of the Railway, as if nature would suspend her laws, and raise a wall of water by which to satisfy the engineer that there *was* impediment offered to the drainage of those places, when the fact of the Railway crossing their drainage level was of itself insufficient to remove his scepticism on the subject. With regard to the many Railway feeders and other roads, he reported, if our memory serves us aright, that he found them breached and levelled with the ground in so many places, that practically they could not have offered any obstruction to drainage—as if that fact of itself was not a sufficient evidence that those roads must have crossed drainage channels, and that they gave way only when they could no longer resist the rush of water, which they had hitherto successfully opposed—and as if such interception had not already done the mischief it was so eminently calculated to effect.

We will here pause to consider the force of an argument very often advanced to the effect that if the epidemic is due to impeded drainage, how is it that places recover, though no impediment to their drainage is known to have been removed? The doubts thus raised against the theory are of easy solution. In a country where the rain-fall is periodical, and where the fall sometimes is as much as six inches or more within three to four hours, this immense volume of water must find its way into some outlet, and if any obstacle is offered in its progress it must make a constant effort to break through the same. So long as such efforts

are not successful, the places of which the drainage is thus intercepted, suffer. But when such barriers are broken through, as in the cases of many roads reported by the engineer referred to above, and the cause of the epidemic thereby removed, the places begin to recover. Where, again, the barrier is too strong to be breached through, the surface water, before being absorbed in the sub-soil, makes a dead effort to find some other vent which it not unoften succeeds in obtaining—more readily so, if somewhat assisted by art, as in the case of Hailisahar. When its natural drainage was impeded by the Eastern Bengal Railway, in the manner described above, it suffered terribly from the epidemic fever for a number of years, because its drainage could neither break through the Railway, nor find some other passage, until a narrow drain was cut through the middle of the village in the direction of the river. For a year or two the drainage would not flow through it, and it used to silt up, because the slope of the village was in a different direction, and because, moreover, the drain had not been cut deep enough, nor a sufficient slope given to it in the direction of the river. When, however, these defects were remedied, the drainage of the place began to rush through it, and the drain from being a narrow channel of four to five feet in breadth when it was first cut, has now assumed the dimensions of a broad canal. The sanitary condition of the place no doubt has since considerably improved, though far from being yet restored to its former healthy state. From personal observation and enquiry we believe this to be the correct solution of the problem, and not because, as some would suppose, that the epidemic was erratically disposed, and impatient of a long sojourn in any one place. We may also remark that malaria, like many

other poisons, is not so fatal to those gradually accustomed to it as to strangers. A village, therefore, though infected with the epidemic, may not, after all, be so deadly to its residents as to new-comers; though to pronounce such a village as having recovered from the epidemic will be as correct, as to declare opium to be quite innocuous, because a Chinaman can with impunity swallow a sicca weight of it.

IV.

We have been favored with a copy of Mr. Metcalfe's report on the state of public health in the district of Burdwan during August last. We find that he has, in a very marked manner, borne testimony to the truth of certain significant facts, which we mentioned in our epidemic articles published in September and October last. Quoting, from the *Patriot* of the 16th September last, what we wrote about the excessive dampness which the houses in the epidemic-stricken villages present, as a necessary consequence of impeded drainage, Mr. Metcalfe writes as follows:

"I have quoted this extract as it describes the popular view of the disease amongst those who are most interested in it *viz.*, the sufferers.

"47. The excessive dampness of houses and tenements as compared with former years is undoubtedly a fact.

"48. If a commission were sitting to inquire into these facts, evidence might be produced in abundance to show this.

"49. It is notorious that in the native quarter pucca houses (this is evidently in reference to the town of Burdwan) habitable in 1862 are uninhabitable now.

"50. That the population have taken largely to sleep on cots to avoid the dampness of the floors."

At about the end of paragraph 9 he says, "the fever has hung about Kanoo Junction, and still hangs there in the most persistent manner."

Para 10. "I attribute this entirely to want of surface drainage."

It is remarkable, however, that, after subscribing in the most unequivocal manner to the above facts and opinions, unmistakably pointing to impeded drainage as the cause of the epidemic fever, Mr. Metcalfe should still cling to the travelling theory, and seek to adduce the following, as facts, unquestionable and incontrovertible, in support of it:

"63. Is it not possible that after all we have been looking too near at home for the causes of this deadly disease?"

"64. We know that it has come to us creeping over the land from the east, gradually but surely.

"65. Jessore, Krishnaghur, Hooghly, all felt its effects before it reached Burdwan. It halted for a time on the eastern bank of the Bhaugiruthee, and then crossed the river, ravaging Poorbusthaly near Culna. It took upwards of two years to travel 35 miles; again it halted on the eastern bank of the Damooda, then crossed to the west."

Now, Mr. Metcalfe does not pretend to maintain that, either in Jessore, or in Krishnaghur, the epidemic observed an even and fixed course, and he must have watched the rise and progress of the fever in the districts of Hooghly and Burdwan to very little purpose, if he is not cognizant of the fact, that it has been very whimsical, indeed, in the choice of its victims in those districts, and that if it has followed any course at all, it is a most erratic one. In fact he furnishes in the very report we are commenting upon a fact, which, while it is quite subversive of the travelling

theory, affords strong corroborative evidence of the truth of the drainage theory. Speaking of the village of Belan in the Bood-Bood circle, Mr. Metcalfe, in para. 18, says.

"So that here we have in the midst of an epidemic-stricken tract one village with all its inhabitants healthy, no deaths, no chronic sickness, no misery in every house-hold, the people breathing the same atmosphere as thousands of their fever-stricken fellow-creatures, and the sole perceptible difference is that *the village is dryer.*"

The italics are Mr. Metcalfe's own. Now what can be a better proof than what the above extract furnishes, in support of the opinion that the cause of the epidemic is local, and not general, as Mr. Metcalfe would nevertheless contend for. If the travelling theory has any basis to rest upon, it is this, that the epidemic, which is said to be travelling, is contagious, and that the contagion is spread by means of the atmosphere. Without waiting to enquire why, if the contagion was communicated through the medium of the atmospheric current, it should not at any one time obey an even course, but that the poison should be wafted simultaneously to totally different points of the compass, and to places situated at long intervals from each other, as we can easily prove by citing a number of instances, and of which fact, it is impossible, Mr. Metcalfe can be unaware. For instance, we may ask why should Belan have escaped, when, according to his own showing, the surrounding country was infected? Does not that very fact show that the cause must be local and not general? And that it is so is proved by the report of Dr. Gupta, which immediately precedes para. 18 in which the statement is made. Dr. Gupta says:

"I paid a visit to Belan. It is just like the other villages with one striking difference, that nearly all the tanks are

good. The men, women, and children looked healthy. *The soil appears dry* (the italics are in the original) : the ground is not higher than the surrounding country. Some of the tanks have overflowed their banks and flooded the roads. The houses are generally kutcha, with a few exceptions. Last year the village was not quite free from sickness, but there was no epidemic; a few cases of fever occurred with a few deaths."

It is evident from the above that the drainage of Belan is quite intact, at all events it has not yet been materially interfered with. The drainage of the village, it appears, first flows into the tanks (as is the case in hundreds of Bengal villages) which when full send the overflow to its natural outfall, and though a road intervenes, it is evidently not high enough to offer any effectual obstruction, as we find that it is flooded in the passage of the drainage to its outfall. The above facts sufficiently explain why the soil of the village appears dry, and how it has escaped the epidemic. The case would have been quite different if the road was higher than the level of the village, and at the same time strong enough not to give way to the rush of the drainage when seeking its outfall. We have not seen Belan, but, judging from the geographical features of Bengal villages, we doubt not that it is separated from the surrounding epidemic-stricken villages by extensive tracts of rice fields, which are quite enough to offer a sufficient protection against the dissemination of the malarious poison from the places where it originates.

That the immunity enjoyed by this village cannot be due to its being blessed with a supply of better drinking water than the surrounding villages, is evident enough from the case of Ballagore, Somra, Goopteparа, Culna, Hallisahar, Kanchrapara, and Chagda. All those places are situated

on the banks of the Bhagiruthee, and obtain their supplies of drinking water from it, and at points much higher, and therefore purer, than that from which Calcutta derives its present supply, and yet but a few years ago all those places were decimated by a deadly epidemic fever from which some of them are still suffering. We are far from underrating the value of wholesome water as an important hygienic agent. We are fully aware that unwholesome drink, by disturbing the digestive functions, may bring on dysentery, diarrhœa, and many other cognate diseases; but we unhesitatingly scout the idea that it will account for the outbreak of the epidemic fever of the type now raging in the districts of Hooghly and Burdwan.

We will conclude our remarks on this portion of Mr. Metcalfe's report by citing a similar instance of exemption precisely under similar circumstances. We allude to the village of Chandoor, which is situated on the eastern bank of the Dwarkessur river, within a short distance of the Sub-Divisional town of Jehanabad, and environed on all sides, except on the west, by epidemic-stricken villages. Its exemption, however, is not due to accident, but to the fact of its situation on a particularly elevated plot of land, removing it thereby from the influence of those obstructions, which, as we showed in our issue of the 16th September last, have effectually shut out the drainage of the surrounding comparatively low-lying villages. It is quite clear, therefore, that the surface drainage of Chandoor must, owing to its advantageous position, find its way into the country lying several feet down below, unless obstruction to it should be offered somewhere in the village itself.

Mr. Metcalfe is sadly unfortunate in his statement of those facts from which he wishes to draw support to his travel-

ling theory. The epidemic did not halt on the eastern bank of the Bhagiruthee, as if it were deliberating as to which villages to seize on the other side, but it raged most virulently on either side, so far as certain villages are concerned, precisely at the same time. For instance, Bullagore, Somra, Gooptipara and Culna, situated on the western bank of the Bhagiruthee, were overtaken simultaneously with Hallishuhur, Kanchrapara, and Chogda, lying on its eastern bank and along the line of the Eastern Bengal Railway—while places like Chatra, Tribani, Baggati and Pandua, situated along the line of the East Indian Railway, had been attacked, and more than half their population carried away before the epidemic had reached the places named above, and situated on the eastern bank of the river. So that, if the travelling theory was to be believed, the epidemic must have been travelling backwards and forwards and in a most random style indeed.

Then, again, Mr. Metcalfe asks: "If local causes alone regulated this ague, why has it left Culna and Poorbusthooly? What possible effect could the silting of the Kannookhal river, miles away, have upon a town situated on the high bank of the Bhagiruthee like Culna?" We do not pretend to know who it was that had furnished Mr. Metcalfe with such an easy means of demolishing the drainage theory, but if he will take the trouble to read the article headed "the epidemic fever" in our issue of the 9th September 1872 (Article I.), he will find, as we have maintained therein, that it was the Railway feeder from Pandua to Culna which by crossing the drainage channel of a line of villages from Bullagore to Culna, that had caused the mischief, and we would respectfully ask him to correct us if we are wrong in this statement. He will, on enquiry, find that the epidemic broke out

in these villages exactly in the order of the time that the road in its progress crossed the drainage channel of each. We cannot answer for Poorbusthooly, not having seen the place of late, but as regards Culna Mr. Metcalfe will, on enquiry, find that the epidemic left it simultaneously with the removal of the cause thereof. The road, when first constructed, was both high and strong, and offered an effectual check to the drainage of all the places lying immediately to the east of it, in finding its natural outlet which is beyond the road and towards the west. The road is a kutcha one, and fortunately for the surviving population of the villages, the repairs to it not having been annually attended to, several breaches have been made in it by the constant rush of the impeded drainage against it. The periodical rains have also contributed their aid in washing away the earth, and thereby reducing the height of the road. So that it can no longer offer the same obstruction to the drainage of the villages in question in making its way to its outfall, either through the breaches, or by overtopping the road as it did before. Thus, the epidemic did not leave Culna because it was tired of it and wanted a change, but only because the natural drainage of the place, having been accidentally restored, was deprived of *that* from which it drew its nourishment. We have since learnt that the road from Pandua to Culna have, within a year or two, been metalled. We would also here correct a mistake that we made in our article on the subject, which appeared in our issue of the 9th September 1872 (Article I.) We there said that the feeder road from Pandua to Culna had interrupted the drainage of Ballagore, Somra and Gooptipara as well as of Culna; the fact however is that that road obstructed the drainage of the last named place only, and not of the other three. A

Kutcha road, commencing from the old dawk road at a point little below Domoordah, and meeting it and the Pandua feeder road at Inchoora, had done the mischief so far as those places are concerned. Both the roads were commenced upon in 1860-61, and the epidemic broke out in a virulent form in all the places lying on their track in 1863-64.

With a view to test if it was true that the sub-soil of the epidemic villages has been rendered humid in consequence, as it had been alleged, of the impeded drainage Mr. Metcalfe writes that he initiated the following experiments:

"54. One drain, more than an inch (mile) in length and in places sixteen feet deep, has been cut, running past the paddy field, and along that *bete noire* of the subsoil theorist, the line of Railway embankment, and yet no moisture has oozed out of the side cutting at all."

"55. Near the village of Jogootee a cutting has been made fifteen feet deep with exactly similar results.

"56. The bed of the Banka is twelve feet below the level of Burdwan town, and wells have been sunk in it eight feet below that again, no side ooze has been in either case perceived.

"57. In preparing foundations for the anicut in the Banka river, when the cutting had been sunk some four feet into the bed, or sixteen feet below the surface of the town, there was undoubtedly a considerable ooze, which became a regular flow. This appearance was for a time corroborative of subsoil theory, till the owner of a distant tank cruelly destroyed the illusion, and complained that it was being steadily drained off.

"Again, two deep tanks have been sunk close to a large patch of paddy land, but we failed to gather any water from

side drainings, and yet it is undoubtedly true that the subsoil of parts of the Burdwan district is moist."

We are only surprised that Mr. Metcalfe should have ever thought that the kind of experiments he was engaged in, could possibly gauge, or even indicate, the presence of moisture in the subsoil. He does not say at what time of the year these boring and cutting operations were executed. If they were undertaken at any time after February, as most probably they were, it was as reasonable to expect that such cuttings would in any part of the district of Burdwan draw much water from the adjacent lands, as it would be to obtain blood out of stone. In fact at no time of the year probably after September could such cuttings be depended upon, as offering an infallible test of the presence, or otherwise, of moisture in the subsoil of a Bengal village. What is already absorbed in the subsoil will not come out in a stream, nor ooze out in profusion. That can only occur when the monsoon water, instead of being gradually absorbed in the subsoil, filters down into a subterranean spring, and that spring is successfully tapped. But in that case there would be no epidemic, for the sub-soil, freed from the moisture by the process of filtration or drainage, would no longer evolve that *something* which is its generating cause. It should not be forgotten also that every village in Lower Bengal is more or less humid after the cessation of the rains, from the beginning of October to the middle of December,—more so than during the continuance of the rains, and fever, precisely of the epidemic type, though not in an aggravated form, is more or less rife throughout Bengal during those months, than at any other time of the year. Hence the period is characteristically described in our country by the term of Jamastaka—meaning that during that period all

the eight portals of the mansion of Pluto are open to receive the dead. The same cause, therefore, which under its normal condition favors the advent of the intermittent type of fever every year in a mitigated form, when intensified as would necessarily be the case when the humidity of the soil is aggravated by obstructions offered to the surface drainage of a village during the rains, and thereby allowing it to be wholly absorbed in the sub-soil, would usher in the fever in an epidemic form. We would entreat those who are engaged in enquiry into the cause of this epidemic to bear this significant fact in mind, inasmuch as all their investigations are sure to prove disappointing, if they start with an idea that the fever met with in the epidemic villages is a stranger to the land.

We have no means of measuring and denoting in figures the relative proportion of humidity, which would distinguish the abnormal from the normal condition. But that the epidemic villages are at present more humid than they ever before were, is universally acknowledged, and no better proofs of the fact could be adduced than those offered by Mr. Metcalfe himself in his report under notice. Mr. Metcalfe would have done better service, to humanity if instead of wasting his time and energies in these so-called scientific enquiries, he had devoted his attention to the investigation of those startling fact, which we have noticed in the columns of this paper from time to time, and which for ready reference we intend shortly to republish in pamphlet form. What for instance could be more suggestive than that the closure of two khals should be followed in the very succeeding year by an outbreak of epidemic simultaneously in a hundred or more villages, and those khals well known to every chasa of the

locality to be the drainage outlets of the villages—though we know to our cost it will puzzle a professional Engineer to discover the fact? What, again, can be more remarkable than that the construction of a single road would be followed immediately in its train by the appearance of the epidemic fever in all the villages, numbering about a hundred, the drainage channel, of which happened to be crossed by that road? We have mentioned many such instances, which we again repeat Mr. Metcalfe would have done well to have enquired into, for we feel certain that a careful, honest, and unprejudiced enquiry cannot possibly leave a doubt in any mind open to reason and unfettered by professional prejudices, that the connexion between the epidemic and impeded village drainage is as intimate as between cause and effect. We are glad to notice that Mr. Metcalfe intends to prosecute the enquiries we have so repeatedly called for during the present cold season with the aid of an Engineer, though we cannot help saying that he might have conducted the enquiry indicated by us much more speedily, and at the same time more satisfactorily, without any such aid. The enquiries he is called upon to prosecute are—

1st. Whether the obstructions mentioned by us do, as a fact, really exist, and whether they really impede the drainage of the villages named by us, and of many others not mentioned?

2nd. When were the several obstructions offered?

3rd. When did the epidemic first show itself? and when did it break out in a virulent form in all the villages, the drainage of which was interfered with by those obstructions?

The second part of the first question might appear to necessitate the aid of a professional man, but we can, from our

own knowledge and experience, assure Mr. Metcalfe that an intelligent chassa, or field-labourer of the locality, will be able to give him more correct information about the drainage course of a village from his every-day actual observation, than any engineer with all the levels which he might scientifically take. The other questions are purely those of facts. So that, there will be a great saving of time, if the enquiries were held independently of any professional aid, which, we are sorry to observe, has hitherto had the effect more to mystify than clear up the question at issue.

While upon this subject we would take the liberty to point out the confusion of ideas involved in the last three sentences with which the *Friend of India* closes its short leader in its last issue (26th December 1872.) on malarious fever in the district of Hooghly and Burdwan "until," says the *Friend*, "the saucer-shaped depression between the Damooda and the Hooghly is relieved, as it used to be, by opening the natural Khals we can expect little mitigation." We presume that the above suggestion is not made without a full knowledge of the drainage system of the country. Those saucer-shaped depressions, which are no other than Beels, are to be found interspersed in great numbers in every district of Lower Bengal, and they are the drainage media of the country. It is into these Beels the surface drainage of the country first collects, to be let out again through Khals into its natural outlet, a running stream. These Beels cannot receive the drainage of the adjoining villages as well as the superfluous moisture from the paddy fields unless the Khals, through which they discharge their overflow into a large steam, are preserved intact. So far the *Friend* is perfectly right. The Beels must be relieved, or the drainage system of the country will be at a deadlock. Some of these channels

have silted up, as in the case of Kana Nuddee, though without as yet interfering in any perceptible degree with the drainage of the country, inasmuch as one of its mouths is opened out during the rains, and no impediment is therefore yet caused to the discharge of the surface drainage, which it is intended to carry. There are other such khals in both the districts of Hooghly and Burdwan, which, though they silt up after the close of the rains, are yet opened out during the rains, and are thus enabled to perform their allotted function. But it is the closure of these Khals by means of roads and embankments and by Zemindars for the purpose of retaining water on their paddy fields, when the same are too high otherwise to retain it, as we showed in our issue of the 16th September 1872 (Article II.), which chiefly causes the mischief we all lament. Admitting as a fact that the surface drainage of the country is necessarily interfered with, if the Beels are not relieved, the *Friend* cannot but also admit that it (the surface drainage) may be also interfered with before its passage into the Beels. A road, running parallel to, but crossing the drainage channel of a village, must, by preventing its flow into the Beel, as effectually shut out its drainage, perhaps more so than if the Beel had been disabled from receiving it by reason of its being full for want of relief. The *Friend* must be aware that a number of roads have sprung up of late in the shape of district roads, railroads, and their feeders, and that it is not unreasonable to suppose that many of these roads have crossed the drainage channels of villages. So that it is not the Khals alone that are at fault, but that the roads have also much to answer for in causing obstructions to the drainage of the country. But what appears to us as passing strange, and as betraying a singular confusion of ideas, is that the

Friend should immediately after recommending the conservating of the drainage by keeping open, the Khals and break out into the following: "The country is water-logged. It requires the same subsoil drainage which converted the Fens of England into rich pastures and prosperous villages." Now, although many villages in both the districts of Hooghly and Burdwan are suffering from the epidemic fever, where, we ask, does the *Friend* discover in the arable lands of those districts a parallel to the fens of England? Though we cannot say of our own personal knowledge, yet we have heard that the fens of Leicestershire did not produce a single blade of grass. Can the *Friend* say the same of any part of either of the two districts named? Are not the crops there now equally luxuriant as they ever were? though we know of instances where the crop could not be reaped, because those that had sown it either died off, or had become too much prostrated by fever to gather the harvest, as in the case of Wobidpore near Khannacool in the Sub-Division of Jehanabad. But we admit that the soil is water-logged. Now, how will the *Friend* explain this paradox of fens being exceedingly fruitful? We will solve the difficulty for him. In the first place he must remember the old age that what is meat to one may be poison to another. What proved to be so destructive to the crop in the fens of England, is food and nourishment to the paddy crop here, and, we believe, he is aware, that in Bengal recourse is had to bunding in order to hold the monsoon water in the rice-fields, or else there is no crop. Whatever may be the quantity of moisture in the rice-fields till September, they begin to dry up from October, and by April and May they are quite dry, so much so that they present cracks everywhere. It is when the fields do not dry up at all that

they fail to yield any crop—and then they might be pronounced water-logged in the English sense of the word. No part of Hooghly or Burdwan has, however, yet come to that pass. Where then is the necessity for subsoil drainage? But suppose any portion of the districts come to that pass, the remedy does not lie in subsoil drainage, but in the restoration of the natural surface drainage of the country. Secondly, what is food to our crops is deadly poison to us. What is so carefully held in store for the nourishment of the rice plants, must be as carefully let out of the villages, or the fever, which, as we have before observed, is endemic here from October to the middle of December, will assume an epidemic form. To account for the epidemic you are not therefore to look to the soil of the rice-fields, or of the Beels, but to that of the villages themselves—and if it is water-logged, the true remedy, as in the other case, is to be found in the removal of the obstructions which have been offered to the drainage course of a village, and not in subsoil drainage. For however humid or water-logged the soil of a village may be, it will under the scorching sun, and without the aid of any subsoil drainage, be perfectly dry by April, when also, epidemic fever however virulently they may have been raging, will of itself begin to abate. To prevent a recurrence, we have only to restore the natural drainage of the villages, and they will without any other treatment return to their normal condition. In fact the application of subsoil drainage to Bengal with its periodical rain-fall of 80 inches, the rivers full to overflowing during the monsoon, and three-fourths of its arable lands under water at least during four months of the year, and relying upon it as a sovereign remedy for the eradication of the disease, appears to us, is as reasonable as the conduct of the man who waited

in expectation of fording the river when it would become dry during ebb-tide. The undertaking recalls to our mind the feat of our ancient sage Agasthya, who is said to have brought the sea into the hollow of his palm and then drunk it off.

V.

In our issue before the last we attempted to show, in reply to certain remarks in the *Friend of India* of the 26th ultimo, that if the epidemic now raging in the district of Hooghly is to be attributed solely to the "saucer-shaped depression between the Damooda and the Hooghly," the remedy lay not in the application to the beels and rice-fields of Bengal of subsoil drainage, which had so successfully reclaimed the fens of England, but in the opening out of the natural khals, which had hitherto relieved this saucer-shaped depression of its overflow, and thereby enabled it to perform its allotted function in the natural drainage system of the country. We have a few words to add to it. We are surprised that a gentleman, like the editor of the *Friend of India*, who, by reason of his long residence in the country, claims the privilege of talking authoritatively on every subject connected with it, should not have been sufficiently impressed with the striking fact that the geographical features of Bengal are quite different from those of England, and the former has consequently a drainage system peculiarly her own, which would be as out of place in the latter as the subsoil drainage of the latter is in the low-lying and periodically-flooded lands of the former. In fact, to our "uneducated" common sense an attempt at such substitution appears to be no less insane than an attempt to grow wheat on lands which we—ignorant Bengalis

—do not yet know to turn to better account than to sow paddy with. But we must admit that the *Friend* is not the only person who fancies that it is to subsoil drainage we should look for the eradication of the epidemic fever. For strange as it may appear, this very scheme was seriously propounded, and strongly recommended, by the Civil Engineer, Mr. Adley, who had been deputed to report upon the feasibility of *draining* the swamps or beels west of the town of Serampore, and was made the basis of legislation in the Bengal Council. Tired of jungle-cutting, which had been prosecuted with unabated vigour, but unattended with any beneficial result ever since the commencement of Sir Cecil Beadon's administration, Sir William Grey seized upon this idea with all the avidity characteristic of the earnestness and sincerity which were always conspicuous in every thing he undertook for the good government of the country. It was in June 1869 that Mr. Adley submitted his report on the drainage and reclamation of the julla or swamp west of Serampore, and both the Governments of India and Bengal were so captivated by the prospect it held out of combining in this country improved agriculture with drainage, which they knew were inseparable in England and Ireland, that they determined upon giving it a practical effect, and towards that end a Bill was introduced in the Bengal Council on the 3rd December 1870. The discussion on the principle of the Bill took place on the 10th of that month, and our review of the literature of the epidemic fever would be incomplete, were we to omit to transcribe what was said on the occasion by the Hon'ble Degumber Mitter from his place in the legislature. We quote the following from his exhaustive speech on the subject :

"Now the whole country—he (Baboo Digumber Mitter) meant Lower Bengal—was full of these bheels or depressions, which were the natural receptacles of the drainage of their surrounding lands. At the lowest estimate he would take a hundred of these bheels to every district. In the eastern districts most of these hollows communicated directly with navigable streams during the mousoons, when they were from twelve to fifteen feet under water. These, he sincerely trusted, it was not pretended should be drained.

"But suppose some of the inland bheels, as in the district of Hooghly, were capable of being drained, how were the hollows to be filled up, except by a gradual process of silting up by the sewage of the surrounding country finding its way into them? and when, after a series of years, they had silted up, they could not present a more elevated surface than the adjoining lands. But unfortunately for Mr. Adley's scheme of drainage, and the removal thereby of the cause of the epidemic, the adjoining lands happened to be paddy lands over which water lodged to the depth of two to three feet, and which continued in that state for at least four months in the year, and these lands, according to him, were equally productive of miasm. In his list of causes were found "moist lands and meadows, or a water-lodged subsoil when dried up under the sun;" again, "rice grounds, especially in jullahs, where the ears of the crops only are cut off, and the stalks left to rot in the water,—thus adding fuel to the fire." Now, was Mr. Adley prepared to drain these rice lands, which constituted nine-tenths of the culturable lands of Lower Bengal, and deprive the people, if possible, of the only food crop the lands were capable of bearing? But what made Mr. Adley so sure that these *bheels* and "rice grounds" were the causes of the epidemic fever? Was not

Calcutta within a mile of an extensive salt-water lake, which, according to him, was still more generative of malaria than a fresh water one, and had it notwithstanding, within the memory of the present generation ever suffered from a type of fever which was met with only since a few years in some of the most healthy localities of Bengal, and which decimated in the short space of a year half the population of a village where it broke out? On the contrary, was not Calcutta particularly healthy of late, and its death-rate reduced to that of some of the English towns, and yet was not the salt-water lake in existence in all its glory? But even as regards the villages surrounding the Dankoonee bheel or jullah, the drainage of which was considered so imperative in the cause of the epidemic that an estimate had been already made, and the drainage operations of which would perhaps be commenced upon immediately on the proposed measure becoming law, did we find anything like an epidemic there? In appendix B, subjoined to Mr. Adley's report, it was stated that in 26 villages surrounding that *bheel* the mortality in three years was only 2,145 amongst a population of 10,949 souls or about 6½ per cent. per annum; whereas, in an epidemic village, one-third, and even half, the population was carried off in one year. But the idea that the *bheels*, which had existed since the formation of the country itself, and the rice lands, which meant the surface of the whole country, were the generating causes of the epidemic, and that they must be drained if the epidemic was to be checked, was so preposterous, that he would not detain the Council with further remarks on that head. Nothing was so natural as that those ugly and offensive sights—the stagnant bheels, rank vegetation, and paddy-fields immersed in water—would suggest themselves to a European, unaccustomed to those

sights, as the most probable causes to account for a terrible epidemic; but he (Baboo Digumber Mitter) was really surprised to find that local conditions of soil and climate, which were as inseparable from us as our very skin, or perhaps more so, should be deliberately and professionally pronounced as causes adequate to account for a phenomenon of recent or casual occurrence, and the same gravely proposed to be adopted as the basis for action. If we were incompetent to grapple with this fell epidemic, as we had evidently proved ourselves to be, let us in all humility admit our inability: but he protested against the adoption of any crude, ill-digested, and haphazard measure which, without eliminating the cause of this epidemic, or in the least degree mitigating its virulence, only served to constitute an additional source of calamity to the people. It was not long since that, in the name of sanitation, and in the cause of this epidemic, a fierce crusade was waged against the vegetable kingdom, with what wisdom he would quote a most able and conscientious officer of Government (he meant Mr. Dampier) to show. In his letter to Government, dated 4th January 1864, paragraph 24, he says:

"It has been said, that as their own neglect of sanitary precautions is the cause of the sickness under which they suffer, the villages have no claim to assistance from without; but I do not believe that the inhabitants of the tracts which have suffered have been greater delinquents in this respect than those of other parts of Bengal, or of this division, who have hitherto escaped. I have seen jungle as thick, and habitations as unclean, in the suburbs behind Alipore, as I have met with in the worst of the fever-stricken villages which I have visited; and it is by no means clearly established that the neglect of precautions which were within the

means of the villages, is the primary cause of the epidemic, although doubtless that neglect has intensified the visitation."

"But while he deprecated in the strongest terms the drainage of bheels and rice-lands, with a view to the removal of the epidemic, he was fully sensible of the absolute necessity of drainage, so far as the villages were concerned. In fact, he had always held, and still held, that fever, wherever and whenever it had epidemically broken out in this country, was wholly and solely traceable to impeded village drainage, caused, in many instances, by railway feeders, which of late had sprung up in large numbers, wherever the same have crossed the drainage course of a village or villages. The same might be said of railways and other kinds of obstructions, whether they were offered in the passage of the rain water from a village to the adjoining paddy-fields, or from the paddy-fields into the bheels or from the bheel into a navigable stream.

"He had no hesitation in saying that many villages in Lower Bengal, especially in the district of Hooghly and Burdwan, were at this moment, and since some years, suffering from defective drainage, caused in some one or other of the various ways indicated in the passages he had quoted; and wherever the same had occurred, it had been invariably followed by the breaking out of this epidemic fever, the intensity of the attack being regulated by the complete or partial nature of the impediment offered to drainage. But the proposed measure, while it provided for the drainage of the bheels and paddy-fields, made no provision for the removal of the obstructions to the free drainage of the villages."

After this complete exposure of the hollowness of the scheme, which aimed at combining sanitation or rather

eradication of the epidemic fever and agricultural improvement by means of sub-soil drainage of jullas and rice-fields, it is hardly necessary that we should say anything further on the subject. We may, however, remark that the very amusing idea of the sub-soil drainage of the jullas, beels and rice-fields of Bengal could not have taken possession of the mind of its originator or its supporters, if they had clearly realized the fact that Bengal had a drainage system of her own, and that that system, unless materially interfered with by nature or man, was quite sufficient with occasional human co-operation to keep her villages dry and her arable lands in a fit state fo the cultivation of suitable crops. We are, however, glad that this to us outlandish scheme was abandoned as a general measure for the drainage of the districts of Bengal, and legislation was confined simply to the swamps west of Serampore, with what practical result either in the way of sanitary or agricultural improvements, time will show.

We would here take leave to observe that the drainage of this swamp is undertaken under legislative sanction even in the face of the striking and admitted fact that the khals through which it relieved itself into the Hooghly, are yet open during the rains. In moving for leave "to bring in a Bill to facilitate the drainage and irrigation of districts in Bengal" Mr. Eden said, "from the first of these reports it appeared that the Khals, or natural drainage channels, which once led from these swamps to the Hooghly, and were formerly navigable for small crafts throughout the year, had so silted up as to be only capable of carrying off marginal overflow during the monsoon." Now, from the above it is quite evident that unlike what the *Friend* would make it appear, the khals, leading from this swamp, like many other

khals, though they silt up, are during the rains, quite capable of carrying the overflow of the swamp to its natural outfall, the Hooghly, thus performing their intended function, for there is no surface drainage to carry during the dry months. The drainage of the villages bordering upon this swamp is thus yet preserved intact, and its sanitary influence is evident from the statistics furnished by Mr. Adley himself. For while the mortality in the villages bordering upon this swamp is shown to be 6 per cent. of the population per annum, that in the epidemic villages, though much more favorably situated, was 75 per cent. during the prevalence of the epidemic embracing two or three years. So that as a measure of sanitation, the experimental reclamation of the swamp west of Serampore was not at all needed, and yet the whole machinery of Government was set and kept in motion for upwards of three years to devise this strange and worthless scheme for eradication of the epidemic fever.

We will now conclude our remarks on this melancholy subject by calling the attention of the authorities to a few salient points in our remarks, strikingly corroborative of the theory which we have been advocating in these columns for the last eight years.

In our issue of the 5th August last we gave a detailed account shewing how a Kutcha road touching the Grand Trunk Road at Myapore and continued as far south as Khanakool had caused the outbreak of the epidemic fever in a number of villages, the drainage khals of which, about ten in number, were closed by a section of that road, as any person visiting the locality could easily see and judge for himself. As a significant fact we also mentioned that the section of the road in question was constructed in 1276 Bengali era, corresponding with 1869 of the Christian

era, followed by an outbreak of fever immediately on the succeeding year in all the villages lying in that section of the road in a somewhat mitigated form, and in the year 1871 it assumed a virulent type. The fever, as a matter of course, had commenced to abate from February of 1872 *i. e.* with the setting in of the hot weather and there was no fever at the time we wrote the article in question. But knowing for certain that it would return with the close of the rains we earnestly exhorted the authorities to open out, without loss of time, the mouths of the ten khals which had been closed by the road in question. We also made the same request with regard to certain other khals, which had been closed by the zemindars, being similarly followed by the outbreak of the epidemic in all those villages of which they were the drainage channels. The authorities did not take any notice of our remonstrance, and we had the painful duty of announcing in our issue of the 19th of the same month that the apprehended return had already taken place, and of drawing attention, in our issues of the 16th September and 19th November last, to the fearful ravages it was committing. We are horrified to record now, that the havoc committed this season by the epidemic is such that in many a household there is scarcely a member left to remove the dead, and this in the face of the weakly reports on public health to the effect that fever is abating in the districts of Hooghly and Burdwan. Now, who is responsible for thus sporting with the lives of Her Majesty's subjects? It is strange, indeed passing strange, that the closure of a number of khals, the visible channels of drainage of the surrounding country, should not have attracted the attention of the local officers, and suggested to them the necessity of some enquiry on the subject. Even if they were not clear-sighted

enough to perceive the connexion between the fever and the closure of the drainage channels, was not the fact of their closure having been immediately and simultaneously followed by the outbreak of the epidemic fever in nearly a hundred villages, of itself sufficient to rouse them from their apathy, and induce them, even as an experiment, to open out those khals, especially when the same might have been done at a trifling cost of 50 to 60 rupees? May we venture to ask why were not the khals opened out at the time we called upon the authorities to do so, and which if done, we feel as certain as we are alive, would have saved the lives of hundreds and thousands, who have fallen victims to this culpable indifference. The mischief for the season has been done, and nothing but the return of the hot weather in due course can prevent the further sacrifice of life. But on behalf of the surviving population we would yet entreat His Honor to open out those khals, and also to remove the other obstructions, which have been offered to the drainage of a number of villages in the Sub-Division of Jchanabad, enumerated in our issues of the 5th August and 16th September last, and which we feel confident may be effected at a cost of not more than 200 Rs. This done we can, we do not hesitate to say, guarantee the restoration of the villages to their former healthy condition.

We beg to be excused for writing so dogmatically upon a subject which has so sorely puzzled professional men for nearly the last twelve years, and we should not at all wonder if in our zeal to propagate our honest opinion we should render ourselves obnoxious to the charge of unseemly presumption. Our apology, however, for thus obtruding our convictions, formed after careful enquiries

and laborious thought, is that we feel very strongly on the subject, and that we believe that the question is one which does not lie beyond the domain of common sense. On the contrary, our own humble opinion is that it is more likely to be correctly solved by a careful and intelligent analysis of facts diligently and discriminatingly collected in the epidemic villages than by the mere application to the symptoms and course of the fever of laws propounded in medical books many of which are yet far from attaining the certainty of scientific truths. We need not say that being natives of the country our opportunities for the collection and digestion of facts likely to lead to a correct solution of the question at issue, are much greater than those possessed by a foreigner to the country, however qualified he may otherwise be for the conduct of such enquiry. Indeed, our conviction of the proximate cause of the epidemic fever being the obstructions offered to the surface drainage of a village during the monsoon, is so strong that we are sometimes lost in wonder, that a thing so plain and palpable should elude the grasp of any man, much more that of the able men engaged for years in catching it—and the only solution which we can offer for what appears to be a strange phenomenon, is the simplicity of the cause assigned. People wonder and many to our knowledge have expressed their disbelief that such a dreadful catastrophe could possibly spring from such a simple cause. We do not, however, despair of the ultimate triumph of truth, though we extremely regret that like the fact of the capers and not anchovies growing in the garden of the Governor of Malta not dawning on the Irishman who fought for the decision of that question before he had killed his adversary in a duel, the cause of the epidemic

fever should similarly not dawn on the minds of our rulers until many more lives are lost.

VI.

We have to acknowledge with thanks the receipt of Lieutenant Colonel F. T. Haig's "Notes on the drainage and water-supply of the Hooghly District," and to apologize for not noticing it earlier. We do not know whether we are to regard the paper as a state-document, seriously penned to throw light on the difficult problem of the epidemic fever, which has engaged the attention of Government for more than a decade, or as a burlesque on the several theories, which have from time to time been advanced to account for that fell disease. The gallant Colonel demolishes, one after another, the different theories with great eclat, and, in some instances with considerable success. Adverting to Jullahs or Marshes Col. Haig says:

"With regard to causation, no connexion has yet been traced between the intensity of the fever and proximity to stagnant marshes, although we should certainly conclude that this would be the case if these were the only generating sources of the disease. On the contrary, there are numerous facts which are absolutely irreconcilable with such a supposition. Some of the villages on the borders of the Dancuni Jullahs have been distinguished by comparative immunity from the fever, while it has raged in others which are quite free from swamps. The Collector reports that Chanditola and the neighbouring villages on the south-west corner of these swamps have generally been considered "exceptionally healthy." Moreover, I believe, I am correct in saying that the southern parts of the District, in which the drainage is in a far worse condition than in the northern, have on the whole suffered less. I have myself seen villages situated on high ground from which

the levels sloped away gradually in all directions for a mile or two, and within which there was not, in the month of January, and plainly could not be at any other time of the year, a vestige of a swamp; yet these had all had the fever; all had a dismal tale of suffering to tell. It is vain, therefore, in my opinion, to look for the origin of the fever solely in the swamps, great or small, scattered over the country, and which occupy an insignificant fraction of its surface."

This is precisely what the Hon'ble Degumber Mitter said from his place in the Bengal Council when the Dancuni Reclamation Bill was first read in Council. After dwelling on other arguments proving the absence of all connexion between the epidemic fever and the marshes of this country, the Hon'ble Member thus expressed himself:

"But even as regards the villages surrounding the Dancuni bheel or jullah, the drainage of which was considered so imperative in the cause of the epidemic that an estimate had been already made, and the drainage operations of which would perhaps be commenced upon immediately on the proposed measure becoming law, did we find anything like an epidemic there? In appendix B. subjoined to Mr. Adley's report, it was stated that in 26 villages surrounding that *bheel* the mortality in three years was only 2,145 amongst a population of 10,949 souls, or about 6½ per cent, per annum; whereas, in an epidemic village, one-third, and even half the population was carried off in one year. But the idea that the *bheels*, which had existed since the formation of the country itself, and the rice lands, which meant the surface of the whole country, were the generating causes of the epidemic, and that they must be drained if the epidemic was to be checked, was so prepos-

terous, that he would not detain the Council with further remarks on that head."

And yet on the pretence of promoting sanitation and—on the strength of the report of Mr. Adley, the reclamation of these Jullahs, which are to be met with in numbers in every part of the country, was considered to be so imperative that a general measure was for that purpose introduced into the Bengal Council, and most resolutely pressed forward. That it was subsequently curtailed in its scope, and limited in its operation, by being made only a tentative measure for the reclamation of the Dancuni Jullah, was solely due to the strong opposition offered by the Hon'ble gentleman. It must, therefore, be a matter of great satisfaction to him that, as regards the primary object of the reclamation project *viz.*, the eradication of the epidemic fever, his opinion is supported by no less an authority than that of Col. Haig. We fear that the other object aimed at in that scheme, *viz.*, the reclamation of the marsh as a remunerative undertaking, is equally uncertain. Already the percentage of profits upon outlay estimated by Mr. Adley, has been cut down by Col. Haig from something like 20 per cent. to 11 per cent., and time will show whether the actual will not be considerably below the revised estimate.

Col. Haig disposes of the bad-water theory of the epidemic fever, in an equally curt manner. He says, "I recently visited the whole of the villages on the banks of the Damoodah for a distance of 30 milles, and was everywhere assured by the people that they drank the river water, which is excellent; yet there is probably no part of the District in which the epidemic has been more prevalent or more deadly."

With regard to the excessive humidity of the sub-soil caused by various obstructions offered to the surface drainage

of the villages, being the exciting cause of the epidemic fever, which was advanced for the first time by the Hon'ble Degumber Mitter when a member of the Epidemic Commission, and which has ever since been strenuously supported in the columns of this paper, Col. Haig observes as follows :

"It will be gathered from the foregoing remarks that I do not look upon drainage *per se* as a complete cure, or even as the principal means of cure, for the fever which has so desolated the Hooghly and Burdwan Districts. All that it can do will be to remove one source of malaria in the swamps, and, to a certain extent, to diminish the excessive humidity of the soil, which last is perhaps the most important exciting cause of the disease. All experience, and the distinctly malarious type of the fever itself, notably the almost invariable presence of splenic complications, tend to the belief that, despite certain facts, which it is difficult to reconcile with the theory, the fever owes its origin in some way or other, directly or indirectly, to the above or to similar causes. But in a rice-growing country drainage cannot wholly eradicate these. It can probably do nothing more than modify the most important of them, and that only in a moderate degree, and it cannot in any way touch those other causes which are wholly distinct, and to which I think, must be attributed the great mortality which has attended the present epidemic. Unless some great and fundamental change take place in the present conditions of agriculture and population, the element of epidemic disease will, I believe, remain, though it may be with diminished force, in spite of drainage, and, in the absence of other remedial measures, may again lead to similar outbreaks, and even reproduce a similar mortality."

The foregoing shows that, while from the symptoms accompanying the fever, and the sequelæ with which it is invariably followed, the Colonel cannot help attaching much importance to the theory, which assigns its origin to something in the soil, still he cannot get over the difficulty of believing it as *the* exciting cause of the epidemic, that cause being ever present in the rice-fields of the country. The difficulty experienced by Col. Haig is, however, one, which, we are well aware, is more or less felt by every foreigner in investigating the subject, and it was with a view to assist people in the mastering of that difficulty, if possible, that we have issued a series of articles on this question. We will, however, once more recur to it.

There is no doubt that the periodical heavy rains must cause considerable humidity in the sub-soil of the country, consisting as it does, wholly or chiefly, of lowlying paddy lands, but it is a very strange fact, the why and wherefore of which we need not here stop to consider, that the effect of this humidity on the human system is not felt so much during the continuance of the rains as on its close, when fever of the malarious type breaks out more or less in every part of the country, and if not soon checked by proper treatment, assumes an intermittent type, and hangs on till the hot weather sets in, when the patient is cured by the mere change in the weather, with little or no aid from medicine. What we contend for is that the fever which is committing such fearful devastations in some parts of Hooghly and Burdwan, as it had often done before in other parts of Bengal, is nothing more than the same fever which rages endemically throughout the country from the middle of September to the close of November. The question therefore arises,—what is it that has converted this

fever in certain places from the endemic into the epidemic form? We submit that the same cause, which in its normal condition was only sufficient to generate the fever in a mild and endemic type, would, when intensified, help to develop it into an epidemic, and that cause, we contend, has been intensified by the surface drainage of such of the villages where the epidemic has broken out, having been obstructed in the various ways we have lately described. We cannot, however, conclude our review of this part of the paper without bearing our testimony to the complete innocence of the rice-fields of all participation in the crime of causing the epidemic, and entreating Col. Haig in behalf of the millions of this country, not to molest them the main as they are if not the only source of the food supply of the people.

Turning from the destructive to the constructive, the gallant Colonel thus delivers himself of what in his opinion appears to be the cause of the epidemic fever:

"I conceive, then, that no explanation of the present epidemic is to be found in the supposition of an increased activity, or wider prevalence, of the causes or agencies which are supposed to produce malarial disease. The sources of the disease I believe to have been precisely the same as have always been in existence in these Districts. The excessive mortality must be due to the failing stamina of the population generally, to a degeneration and loss of vital energy, which render them less capable of resisting the morbific influences to which they have always been exposed. And I conceive that this is due chiefly to the increase of population having outstripped the means of production, to an impoverished and under-fed condition of the great mass of the people; in fact, that we now witness the last sad stage of

that process (hastened in this instance by unhealthy conditions of climate, and perhaps also by excessive rents) by which over-population, in the absence of any special counteracting or remedial measures, works its own sure."

We know not which to admire most, the perfect simplicity with which the theory involved in the above passage, has been broached or the gravity with which it has been worked out. And if we take the whole to be a burlesque, or a travesty, of what has been theretofore said on the subject, it is because it surpasses our belief that any sane man would seriously thank that the exciting cause of the epidemic fever was want of sufficient nourishment, much less a person of the power of observation and intimate knowledge of the country like Col. Haig, however since it has been started in a grave official document and the suffering of the people in the affected districts may be intensified by hasty and inconsiderate action founded on it, we feel ourselves called upon to enter our solemn protest against it. We believe a greater muddle in the name of science has seldom been presented to the public, than in this nebulus of high rent, failing stamina, weakened vital energy and deficient food supply to account for a local complaint, increasing and decreasing without any reference to the rise or fall of good grains. If there be any truth in the idea of deficient nourishment and epidemic fever being related to each other as cause and effect, how was it we may ask that the fever did not make itself manifest when its alleged cause was in operation with greatest force and intensity in the Orissa districts during the famine year of 1865-66? The whole province of Orissa is essentially a rice-growing country, more so than either Hooghly or Burdwan; and the famine broke out at a time

of the year when miasm was most abundantly propagated, viz. during the close of the rains, and yet amongst a million of deaths, which must have occurred within the short period of a year, not a single case was known to be preceded by or accompanied with any of the symptoms, which are invariably attendant on the epidemic fever, wherever and whenever it breaks out in this country. But even in the case of Hooghly or Burdwan, does not the unanimous testimony of all medical men show that the epidemic is quite impartial in the selection of its victims, and that wherever it breaks out it spares neither the rich nor the poor? Is it not a notorious fact, again, that in both those districts, out of 50 villages within a given area 40 are attacked, and 10 have entirely escaped? If so, is it to be supposed that the people living in the favoured ten are the only well-fed out of all those who occupy the 50 villages within the given area? Is the town of Jessore, suffering from the same fever for the last 50 years because it is the only place in the district where the people ill-fed? and was Cossimbazar, at one time the emporium of Bengal, depopulated during the height of its glory by the same epidemic fever because of want of sufficient nourishment? Such questions drive us to the idea that Col. Haig is not in earnest. As a satire on the jungle-cutting and the like theories, seriously propounded and vigorously carried out from time to time, the Colonel's paper is a great success, and if in noticing it seriously, we have proved ourselves impervious to a joke, our consolation is that we are in good company, albeit one of our companions is a Scotchman, to wit the Serampore *Friend*.

As a project for reclaiming a few thousand acres of land from swamp, and rendering them fit for cultivation with paddy, we have grave doubts whether Colonel Haig's scheme will prove more effective or sound than as a measure

of sanitation. If during the monsoons the beds of the swamps are higher than the water-level of the stream into which it is intended that they should empty themselves, no doubt they will gradually silt up by washings from the adjacent country. But it will be a work of time, and the time it will take to make the work reproductive will of itself considerably reduce the estimated dividend (9½ per cent.) on the outlay, even if that estimate should eventually turn out to be correct, and if the projected works ever became accomplished facts. Our lay opinion, we know, will not weigh as a feather against that of a professional engineer. Nevertheless we cannot refrain from observing that it is our strong conviction that the filling-up of these marshes, which are in the first instance the natural receptacles of the drainage of the country, before it finds its way into a navigable stream, will necessitate a complicated and most expensive system of artificial drainage (something like that of Calcutta,) which the country will be utterly unable to pay for, and which, unless carried out simultaneously with the drainage of the marshes, will be productive of the same disastrous consequences to the whole district, which are now confined, to a very small area of it.

We are afraid Col. Haig has not also made a correct use of his statistics in drawing his conclusions about the insufficient food-supply of the district. Col. Haig, to be on the safe side, modestly assumes for his calculation the population at 940 per square mile instead 1045, as obtained from the last Census returns, but taking the population even at the higher figure and admitting for the sake of argument that the staple food crop of the country, viz. paddy raised from a square mile of the country is insufficient to sustain the population thereof, we would take the liberty to

remind him that, unlike most other districts a large area of Hooghly is under the cultivation of sugarcane, potato and other valuable crops—the net return from a biga of which is six times that of paddy; and it would be as reasonable to infer from this condition of things that the population of the Hooghly District suffers from insufficiency of food, as to assume that certain Departments of France and certain counties of England did so, because the wheat crop there has been supplanted by hops and vine. If the primary object of Col. Haig be to augment the food supply of the country, he would have a much surer basis to work upon, and his efforts would be more likely to be crowned with success, if, instead of wasting his energies on the marshes of Hooghly, he would direct his attention to the reclamation of the unappropriated lots of the Soonderbuns. With a fourth of the proposed outlay, we can assure him, he will supply the country with treble the quantity of paddy he estimates from the marshes of Hooghly.