CALCUTTA

AND

ITS SANITARY CONDITIONS.

BY

A. LASSUS,

DOCTEUR EN MEDICINE DE LA FACULTÉ DE PARIS.

Calcutta:

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To THE

CHAIRMAN and JUSTICES of the PEACE,

For the Town of Calcutta.

GENTLEMEN,—*The appointment of a Health Officer for the Town of Calcutta having not yet taken place, but being in contemplation for the next Extraordinary Meeting called for that purpose, I have seized this opportunity, of the short time left to me, to write the few following pages upon the nature of the duties which, in my opinion, will have to be performed by the appointed Officer.*

It has been, and it is yet, I believe, amongst persons strangers to the Medical Profession, a matter of great controversy and difficulty, evidenced in the late discussions and in the considerations of the Calcutta Press, about the subject, to come to a true and positive definition of these duties. Such a definition cannot be given in a few words only, and from that circumstance, I am induced to try to supply this want myself, as a candidate for the above appointment, and to expose, in a brief manner, what they are to be.

To be clear and well understood, I have divided my curtailed pamphlet into two parts; the first devoted to the summary description of the would-be desirable

sanitary conditions of Towns in general, and the second,—taking the first as a standard of comparison,—I have considered the actual sanitary conditions of Calcutta and its suburbs.

Any of my readers will thus be able, after perusing it, to see and judge for themselves the existing differences, or the defects, and to understand all that a Health Officer, prepared and really adequate to his work, will have to do: the field is an immense one and broadly open before him.

Owing to the necessary limits which I am bound to, I have, however, been unable to treat the matter to its full extent, as it should be, and I have therefore confined myself to the most important and principal points; for that reason, I beg to claim your kind indulgence about the very incomplete hygienic considerations which I have the honor to submit to your high judgment and fair appreciation, in support of my candidature *for the said appointment.*

I beg, Gentlemen,
To remain,
Yours most respectfully,
DR. A. LASSUS.

CALCUTTA,
The 24th December 1863.

CALCUTTA

AND

ITS SANITARY CONDITIONS.

PART I.

In the present advanced state of civilization, the most important duty of the Magistrates of a large City is, certainly and before all, to try, by every possible means, to remove any dangers threatening the general health, and to destroy, avert or palliate the causes of such dangers, when it is in their power to do so. Without health, effectively, there is no comfort, no possible work to procure it, and without work, no fortune, no family welfare or happiness; for disease, with the most cruel pains, brings on disaster, gloom and ruin.

All judicious and wise men will, I have no doubt, grant me this, that, according to the situation, disposition of the cities, and to the large number of their inhabitants, the conditions unfavorable to public health may be brought to the highest degree, and that very severe and various diseases are the result of their combined action, or that, at least, they bring on particular constitutional pre-dispositions, the causes of which medical men certainly know as well as they do the remedy. Great many are the dangers arising from the agglomeration of large numbers of men: medical

science has not in store the efficient means of avoiding them all, but it has in its power to fight out successfully many of them, and to annihilate some others in suggesting and framing particular hygienic laws and regulations. No one can deny that a considerable number of towns are still in want of the sanitary rules which it would be so desirable and satisfactory to see them subjected to : such a state of things is to be attributed to nothing else but ignorance, neglect, or private interest, and they then require either repairs, new works or improvements wanted for the sake of public health, but which time only will gradually accomplish : at all events, the intended improvements ought to be executed according to the precepts and laws of a good hygiene.

Admitting, therefore, this to be the Magistrates' duty, let us see what are the best and most necessary sanitary conditions for a large city, which they must endeavour to secure.

Atmospheric air, being the *medium* which men and other animals live in on the surface of the earth, is the first on the list, as it is the immediate agent, the good or bad qualities of which modify very differently its salutary influence upon organism.

Habitations, dispositions of the town, streets and their cleanliness, and drainage follow, for from their satisfactory state depends much the purity or impurity of the air in a city.

Water comes third, as being, after air, the most important, and not less necessary, if not more, of all the wants of life.

Eatables, added to air and water, are not less important to obtain the increase of the bulk and restore to every organ whatever it may have lost in strength and vigour ; they have,

ATMOSPHERIC AIR.

It is a well known fact that atmospheric air is to be found in the country in an almost perfect state of purity, while in towns, principally the large ones, its composition must be necessarily altered in a great degree. If we consider that in such places hundreds of thousands of men and animals of all kinds breathe the same air, that it is, often, like imprisoned in narrow streets, which it circulates through but with the greatest difficulty, where it becomes impregnated with filthy vapours and effluvia, owing to the constant decompositions of vegetable and animal matter, we must come forcibly to this conclusion, that it must be turned soon into an unfit agent for the physiological and most essential act of respiration, and, as a matter of course, a cause of more or less severe diseases, which very often, if not always, are got rid of by a few days, weeks or months' living in the country, as a change and where the same evil causes do not exist. *Remotâ causa avertitur morbus.*

The atmospheric air's chemical compositions is what must be considered as its purity or perfect fitness for respiration ; it is now generally admitted that it is essentially composed out of the combination of two elementary gases, *namely*, oxygen and nitrogen, mixed in the following proportions :—

100 parts of air contain—

in weight	23·01	oxygen.....in	volume	20·81	oxygen
	76·99	nitrogen .	,,	79·19	nitrogen
	100·00			100·00	

besides it contains a very small quantity of carbonic acid and a variable proportion of water in a state of vapour.

Consequently, when this its normal composition is altered,

with other gases, its effects upon organism must prove more or less fatal, and it follows that all available scientific knowledge must be taken advantage of in order to prevent its alterations, principally by its mixture with any of the following chemical combinations, *i. e.*, carbonic acid in excess, oxyde of carbon, bi-carbonate hydrogen, phosphored hydrogen, arsenied hydrogen, and sulphured hydrogen, cyanogen, and lastly, with those suffocating gases, *i. e.*, chloride, hypo-azotic acid, and ammonia, all which are differently and more or less deleterious poisons. The study of their properties and mode of actions would be here out of place, but I thought it necessary at least to mention them as being generally the chemical agents which vitiate the atmospheric air of large and badly cleaned cities, for such a study would lead me to explain at some length why it is not only not indifferent, but even of an absolute necessity, to have good and pure air to inhale in our lungs, had I not been already satisfied, that all my readers, though being well-educated men and, consequently, familiar with the popular notion of the vivification of blood by the proportion of oxygen introduced into these organs, are not sufficiently acquainted with science to justify here the exposition of all the admitted theories upon the subject. I will then confine myself to all what I have said above, feeling convinced that these few and short explanations will sufficiently answer my purpose.

DRAINAGE, STREETS, HABITATIONS, &c., &c.

As a natural consequence, and a logical deduction, the question of drainage, cleanliness of streets, and habitations, &c., &c., &c., must call next the attention of Municipal Authorities, for from the cleanliness of streets and houses, their

much depends the salubrity of the atmospheric air in a city, and the remarks necessarily or accidentally omitted in the above will find here their complement.

Generally, towns built upon an elevated ground are, with a few exceptions, considered as very healthy, on account of the easy access of the winds, which constantly renew the atmosphere and promptly carry away every filthy and noxious emanations from the streets; the effluvia of surrounding marshes and swamps, if any, cannot but with the greatest difficulty reach their elevation, and even then, by the same action of the breezes, they are immediately blown away, leaving behind a brisk and dry aerial fluid, two most eminent qualities, and in the highest degree beneficial to organism.

Those, on the contrary, situated in the plains, are not in possession of such favorable conditions, and their salubrity is, in a relative degree, depending on circumstances like the following: the more or less considerable extent of the plain, the quality of the soil, its dryness or dampness, the direction of the predominant winds, the vicinity of marshes always unhealthy, and the danger increases according to the heat of the climate. In such cases, then, appropriate measures are to be taken to protect the people against any evil inconveniences.

Attention and care must be paid to the disposition together of the private dwellings, the reunions of which compose the town, or, in other words, to the disposition of streets and public places—that disposition has such an influence upon general salubrity, that it must be so calculated as to facilitate the circulation of the air and the access of the sun's rays to the lowest parts of the houses: narrow streets between high buildings shut up a corrupted air—in broad ones the same fluid is too still, and soon altered in calm and hot weather. In a burning climate, however, when the town is exposed to the

ardent rays of the sun, not a few of the inconveniences arising out of that exposition are obviated by streets narrow, tortuous, and lined with high buildings. Wide open public places or squares will considerably contribute to the easy circulation of the air within the town, and, on that account principally, their number ought to be increased as much as convenient.

That is not enough : besides these general dispositions, it is incumbent, too, on the Municipality, to interfere, in a certain degree at least, with the landlords and tenants. In a town, men necessarily accumulated within very confined enclosures are exposed to those innumerable emanations given birth to, from their congregation itself,—to those of the animals which they keep or breed for food or use,—to those of the workshops where are manufactured the produce of art and industry : they,—men, animals, and even buildings,—mutually deprive each other of the beneficial influence of winds, without which a corrupted atmosphere cannot be renewed, and of the not less useful action of the sun's light, which dries away the dampness and is one of the stimuli for the life's preservation not to be dispensed with. A good public hygiene, then, implies the greatest cleanliness of houses, both internally and externally.

Again, that would not be enough to preserve the salubrity of atmospheric air : there are some more causes of vitiation always ready to alter its purity, and which are certainly falling under the control of Municipalities. To be kept perfectly clean, streets, roads, and public places require a well-taken-care-of pavement, whatever be its material, for any neglect or indifference in that respect would very soon, owing to circumstances and weather, turn their surface into real swamps or marshes, sources very often of dreadful

offer a sufficient slope and declivity to facilitate the flowing away of waters. All rubbishes, detritus, or any matter susceptible of putrefaction, are not to be allowed to remain in the streets or yards, and must every day be cleared away; in dry and hot days, water abundantly supplied, will irrigate and wash the kennels and side drains.

The question of main drainage is not an unimportant one—to the contrary: there is not a single town, perhaps, where it has not been carefully considered, resolved favorably, at any cost or expense, and consequently put to execution on a less or larger scale. After all what I have written above, and what is generally known, I need not, I think, reflect in any way upon its necessity or usefulness, but I will simply confine myself to a few remarks.

The system of drains ought to be so combined as to correspond, so to speak, to the system of streets; each of the latter, even the remotest one, should have its own underground tunnel, discharging its contents into a main and principal one of a much larger and proportionate capacity, either naturally by a gradual slope, or through a mechanical power suggested by engineering skill. Though intended to receive all water discharges, every filth and dirt, these drains require now and then washing and cleansing, even sometimes overflowing, lest they might become themselves an immense and fearful focus of infection, just the contrary of what they are intended for. The neglect of such a precaution leads to the formation, within these vaulted canals, of gas ammonia, sulphured hydrogen, nitrogen, and very likely to several other chemical principles or combinations, all which, as I have already stated, are more or less offensive.

The mode of construction of these works is not indifferent for their proper and expected efficiency; but I could not here, without trespassing on my limits, or encroaching upon the ground

of architects, point out all what is to be considered about it. I cannot help, however, mentioning, that funnels going up to the surface of streets, and as many as convenient, should be kept open, or rather fitted with iron gratings, instead of being hermetically shut up, and allowing thus a good ventilation to take place without difficulty.

Places for carrions and rubbish, deposits of all bodily excretions, slaughtering-houses, should be as far distant as possible, and out of the most ordinary currents of wind, which might otherwise blow all their exhalations all over the town. Such considerable heaps of putrefied matter have not certainly always the deleterious effects, so often attributed to them, but their offensive smell is alone a very serious inconvenience. The same might be said of any workshops or manufactories, unsafe on account of their doubtful emanations, while some others may be allowed within the limits of the town, without exposing the city to any danger of insalubrity.

WATER.

The question of water for the supply of a large city is, certainly, of the highest importance. Like atmospheric air, water is one of the elements necessary to life, but owing to the great proportion introduced into our organs, and the continual use of it, drinkable water possesses a considerable influence upon human organism when it contains any noxious substance. It has been said somewhere, that from the compared beauty of populations, the qualities of water might be ascertained, but I will not try here to prove this assertion, as it would be too difficult a task, and my endeavour will only be to point out the necessary qualities of the water which a large

Drinkable water is the expression commonly spoken—I think *public water* would be better said, considering that water is not only wanted as a drinkable, but for every other purposes of life. Whatever it may be then, as far as water is concerned, its procurable quantity is first to be taken into consideration, for its abundance must be in relation with the number of the inhabitants. It has been attempted to calculate the quantity of water necessary for an adult within twenty-four hours, but it will be easily understood that this quantity must vary according to several conditions: age, weight, exercise, temperature, &c., &c., have a certain influence upon the daily losses of water sustained by organism, and consequently upon its wants of the same fluid ; but the average quantity required by an adult, within twenty-four hours, has been found to be about half a gallon, either as a drink, or mixed in the preparation of victuals. I say this quantity is required, for, should the proportion be too small, or too large, in both cases more or less serious inconveniences would be the result—in the first instance, a succession of physiologico-chemical phenomena takes place, which by degrees cannot fail from injuring the health; as an illustration of this, and out of many other examples, they bring on acidity of saliva, and as an inevitable consequence, the decay of the teeth. It is proved by observation, in fact, that persons taking in very little of water lose generally very soon their teeth, and consequently become exposed to more or less serious diseases of digestive organs arising out of an imperfect mastication of their food. Besides, from the same causes, and after the same process, their urine's normal density becoming altered, they find themselves exposed again to sandy or stony concretions.

To the contrary, if the quantity of water taken in is in

longer period manifested, and consist principally in digestive disorders and a premature general debility.

These considerations prove most evidently, that every member of the community requires his amount of water to preserve his health, and cannot be cut short of his natural wants ; hence the imperious necessity to provide by any means for the community at large, and to bear always in mind, that, independently of water as a drink or used in the preparation of food, water too, and in a great quantity, is wanted for great many other domestic purposes.

Now, it happens that the most convenient water to answer these aforesaid purposes, is exactly the best fit for human consumption in respect to the preservation of health, and that is an indisputable fact, for general facts cannot be contradicted. In whatever place we may find and like to take water, it has always the same origin, it comes from the high atmospheric region, and whether it arises from a spring, or flows in a bed, its only and certain origin is rain. If we consider rain water, we find that like water distilled by a chemical process, it is good as drink, but not until it has been aerated, or been modified by the addition of either an aromatic, alimentary, sugary, bitter, acid, or any tonic principle whatever In countries where rain water is the only available one, measures must be taken to improve it, at least with that necessary quality, aeration, before allowing its general use. On the other hand, if we consider the water supplied to a city, from springs or from rivers, to be wholesome, it should possess certain peculiar qualities, and these are its general and distinctive characters.

It must be entirely free from any smell whatsoever, of a not very pronounced but pleasant taste ; limpid, cool, light, and aerated ; soap will be easily dissolved in it ; vegetables,

lastly, it will retain its brightness after the experiment of ebullition.

Such are the apparent characters of a wholesome water; but all waters do not enjoy the whole of these properties, for, according to different circumstances, they may be more or less altered in their composition, hence the importance of their careful investigation previous to their free and public use. This is the delicate duty imposed upon the hygienist — duty, the efficient performance of which, improving always the welfare of communities, raises Medical Art to the highest climax and justifies its glorious ambition.

With regard to the wholesomeness and fitness for domestic uses, the impurities altering water are only of two sorts:—

First.—Mineral or Inorganic.

Second.—Organic.

In a potable water, the quantity of mineral or saline substances, according to the best contemporary authorities, must not be under 60·00, and that of the organic ones not over 1·00; above these proportions, if the excess is in the saline matter, or in their constituent elements, water becomes medicinal; it must be considered as a slow poison if the excess exists in the organic impurities. Limpidness and temperature are accessory and transitory qualities, perfectly inconstant, and in no degree at all interesting the question in itself. The action of water upon organism is not to be computed from the quantity introduced into the digestive organs only; for, the accommodation of eatables, the preparation of bread, the artificial beverages, &c., &c., convey into the system their own contribution. There is nothing else, but that so much required use which gives water its importance. Where is the other useful substance which could bear comparison with it, as regards its general and permanent influence on public health? Even if facts, gathered from compared statis-

ticals, would not prove it, theory alone should sufficiently explain in what degree of relation is mortality in agglomerated masses of people with the more or less perfect state of purity of the water supplied for the use of the community. The chemical analysis, the judicious investigation of the causes of diseases particularly prevailing in the locality, the number of deaths, &c., &c., become then true and solid grounds for judgment. Consequently, no man could deny the importance of this question, considering that, out of the three constituent elements of every climate, water is the only one which human power and control may, in some positive way, be acted upon.

With reference now to what I have mentioned above, namely, that amongst other qualities potable water must exhibit a certain proportion of air—or better, of oxygen—from very recent scientific investigations it would appear that such a condition is not imperiously wanted, but, however, the most generally admitted opinion is, that the best water is that which combines with a certain quantity of air a given proportion of saline matter.

This being settled, let us go into a few particulars concerning the waters contaminated by the dissolution of mineral or inorganic substances, or polluted by the presence of organic matter.

At first, sea water, as it is generally known, cannot be taken or used as a wholesome drink, and is unfit for domestic purposes in its natural state, owing to the great quantity of the saline substances dissolved in it ; but it is now in the power of man to turn it into good account, and to render it fit for both uses by congelation or distillation. I am quite satisfied of merely mentioning this fact, as it has otherwise no connection with my subject, considered in a general point of view.

In some waters arising out of springs, of wells, natural or artificial fountains, it is not extraordinary, according to the nature of the soil, to find mineral substances hold in solution, as a cause of their unwholesomeness and impropriety—these salts are most commonly carbonate of soda, sulphate of lime, sulphate of soda, and sulphate of magnesia. Spring water, consequently, is not always to be depended upon, and from the circumstance, that it may sometimes prove good, sometimes bad, either accepting or rejecting it, must be first taken into consideration.

River water generally differs from spring water, but they possess a common origin, as well as common qualities, derived from their mixture with rain water, which owes its own qualities to its origin itself and its aeration when it has taken place. River water is contaminated by the saline impurities of the sea water as far up as the tidal influence goes, and above, it must, as a matter of course, be found in a better condition with regard to the inorganic substances held in solution.

Now spring, river, and even water gathered sometimes and kept in tanks, are less or more polluted by organic impurities, principally in towns, where they are derived from the decomposition of animal and vegetable matters, from all the dejections of the human body, and through a badly managed system of sewage. I need not insist, I suppose, upon the necessity of ascertaining the presence of such principles, the immediate causes of so many a disease; our sensorial faculties are very often, it is true, sufficient to warn us against the danger, but in some cases potable water, though very clear and bright, with not very much perceptible taste, contains nevertheless a good proportion of organic matter, which, like the inorganic, it is the duty of Science to detect and point out for the sake of the community.

I cannot go further on with these remarks, though the subject is far from being exhausted and fully treated, owing to the short time left to me and to the limits of this pamphlet; but I must, according to what has been stated above, lay down the following conclusions :—

First.—Pure and wholesome water is necessary for the preservation of health as a drink and for domestic purposes.

Second.—Its abundance must be in relation with the extent of the population it is intended to supply.

Third.—River or spring water, the latter if abundant enough, possessing the conditions of wholesomeness referred to, may be accepted.

Fourth.—Rain water, aerated and properly kept in tanks, is to be preferred according to particular circumstances and to the localities, and principally if its supply may be considered as unlimited.

EATABLES.

Men feeding upon animal and vegetable substances require them in abundance and variety, and principally of good quality. This last condition cannot be an indifferent one, for, from the daily use and want of food and beverage, mankind is incessantly exposed to the salutary or dangerous effects derived from their good or bad qualities. Their influence on the physical constitution, on the various diseases which people are visited with, could by no means be ignored. It is not certainly one of the ruling Magistrate's attribute to meddle with or control the details of domestic life, and to command those ordinary precautions the neglect of which may prove fatal to health, but they may, and it is their duty to do so, promote and propagate any useful notions, by means of which all classes of

through their prejudices and imprudence, they might be exposed to.

I will state, consequently, that it is incumbent upon the representatives and protectors of the security and public interest of citizens, to preside, so to speak, to the preparation of all substances intended for food in general, to watch with care and attention the sale of victuals, to repress that vile and base cupidity of those dealers always ready to avail themselves of fraudulous or noxious sophistications, and give thus to the alimentary substances apparent qualities which they are not really possessed with. I will further add, that the Magistrates are in duty bound, for the sake of public health, to strictly forbid the sale of such substances, the nature or alteration of which turn them into food of injurious character. In some cases, eatables, without being sophisticated or adulterated, are destitute of those qualities they should possess; their deleterious qualities may be primitive, or their once wholesome characters may be lost, from alteration through natural decomposition, neglect in their preservation, or prejudicial mode of preparation. Is it not then evidently necessary, that for the sake of all, the care and attention of Authorities should be called on to this state of things, and that they should avail themselves of medical or other scientific advice upon the matter?

I cannot here, for the same reasons mentioned above, go into the chemical, physical, or physiological study of all the alimentary substances in general; an entire volume, and a very big one too, would be the result of my writing, if I chose to treat the subject to its fullest extent. A very short notice upon the principal eatables usual to mankind, including considerations as regards their wholesome qualities and their alterations, will be, I believe, quite sufficient.

It is exclusively from the organic kingdom that man is exacting means for his subsistence: vegetables and animals alone supply his food: in the mineral kingdom he finds no eatables, properly speaking, but merely condiments, which, mixed with the alimentary matters, improve or assist the digestion, now on account of their taste, then through stimulation of the digestive organs.

Air and water may be, it is true, considered as nutritive substances, but such a denomination is only given to those matters which, ingested into the stomach, become fit to quiet that particular sensation called *hunger*, and there, after some successive changes in their actual state, supply the solid portion of blood, and become, on account of their immediate principles and their combination, constituent elements of organism. Oxygen, hydrogen, carbon, and nitrogen, are principles common to both animals and vegetables; but out of their combination are produced stearine, oleine, butyrine, sugar of milk, lactic acid, fibrine, which is an important constituent part of blood and basis of the muscular matter, osmazome, a savoury principle, albumen, gelatine and caseum, for the animal kingdom; while for the vegetable one, sugar, gum, and starch, great many acids, such as acetic, oxalic, tartaric, &c., &c., and a very long list of other combinations.

These are the essential elements of the articles of food, the combined proportion of which, reduced by the constant and natural deperditions, must be restored to our body, to preserve life and health, in like manner as oil must be incessantly supplied to a lamp to keep it burning.

Butchers' Meat.—Butchers' meat is the most important of all the substances derived from the animal kingdom, and constitute the most usual food of nearly all the civilized world. The comparative state of health of the

cattle which supplies it to our markets has a great deal to do with its qualities. Particular diseases, very common with those animals, not only deprive their flesh of the characters it ought to retain, to be perfectly fit for food, but yet, through the peculiar alteration taking place in it, or the decomposition which is setting in, a short time after death, they communicate to the substance itself almost deleterious properties. Amongst the causes of such an occurrence, I will mention in the first place one which is not enough perhaps paid attention to—I mean fatigue from a long and forced march, or the pangs of fear and pain. *Secondly*, the age of the cattle is to be taken into consideration: when they are too old, their flesh is hardened, indigestible, and hence a poor material for nutrition; on the other hand, if they are too young, it is nothing but a mass of gelatine, the volume of which bears no comparison with its limited restorative capabilities, for it contains very little of fibrine and yet less of osmazome.

Now, as to the various diseases affecting the animals, I will state that there are some on account of which they must necessarily be objected to, and others which, having not a great deal of influence on their general system, would not justify the hygienist, if he chose to reject them as an improper substance of food, though such a meat is, as a matter of course, of inferior quality. Considering, then, that from the organic elements which our constitution derives from meat, as explained above, depends not in a little degree the maintenance or increase of the bulk, no one can deny the importance of a good and providing Administration, whose duty it is, consequently, to take proper steps towards the adoption of convenient measures, if possible, with regard to the abundance and wholesomeness of butchers' meat, and principally to

Poultry and Game.—All that has been said about meat may be repeated in respect of poultry, game and venison ; and though many people have sometimes a particular fancy for the latter when in a beginning state of decomposition, its exposition for sale should be prohibited.

Fish.—From its being another important item in the list of victuals, and a very usual one, the most careful attention must be paid to the fish offered to the consumers. From its nature, it cannot resist decomposition so long as other animal substances, and on that account it becomes soon an unwholesome food. Even, when unaltered, if caught in waters suspected on account of any impurities they might be contaminated with, as for instance those which hemp or flax are soaked in, it will prove injurious to health.

Milk.—I need not reflect in any way, I think, upon the good qualities expected to be met with in that so precious and so useful an animal substance. They are so well known, that it would be here a mère waste of writing and reading, but a few remarks may not be out of place in respect of the alterations of its characters and properties through neglect or want of care, and of the numberless falsifications to which cupidity and treachery are the leading causes. Water is the most usual substance resorted to for the last purpose ; but that water process of sophistication has not the least injurious effect, provided the water be pure and wholesome : the same character of innocuity may be said of flour, starch, or any other emulsion mixed in it. If kept for a certain time, however, in lead or brass vessels, it contracts very often poisonous qualities, the serious inconveniences of which are generally attributed to the falsifications by ignorant or imprudent people.

The health of the animals which supply it, the sort of

not without a considerable influence on the qualities of milk: as an illustration of this, I will venture to quote a fact, which, if authentic, cannot fail from filling the heart with terror—it is extracted from a work on public hygiene:—

"A cow had been bitten by a mad dog; thirteen persons hav-
"ing their milk daily supplied from that cow, were attacked
"with rabies each after a different period of time; out of them
"only two recovered and eleven others died subsequently."

Such a case requires no comment, I leave it entirely to the consideration of my readers, and I will further state that a great many other cases of the same kind, though not derived from so fatal diseases, and without the same result, might be mentioned here. Milk, then, as well as any other alimentary substance, is entitled most evidently to the incessant vigilance of Administrations, and severe penalties should be inflicted to wilful and criminal negligence, when it is supplied from diseased animals.

Flour and Bread.—Independently of any unwholesome qualities transmitted to it from the grain itself, flour may be adulterated and sophisticated in various ways. Wetness, fermentation, insects devouring its most nutritive parts, accidental or voluntary mixtures with sand, plaster, chalk, ceruse, alum, and principally with other inferior meals of every sort of corn, less or more nutritive, are the principal agents of alteration or sophistication. It is obvious that in such conditions it cannot be an acceptable bread-stuff, and must of course be rejected. Their influence upon the health is often the only sign from which are detected several of the alterations, for bread made out of such flour, must show the same improper or altered materials: in that case the best remedy rests with the Authorities, who may order the stores of bakers to be inspected and flour to be examined: to con-

clude, then, the use of such flour, and the sale of any deteriorated bread, must be put a stop to.

The other alimentary vegetable substances would only call forth considerations of no importance. Their incomplete maturity and spontaneous alteration are easily perceived and lead to their rejection.

Oils, spices, vinegar, &c., &c., are not more exempt of natural alterations, or of fraudulent practices, in their compositions, which call the attention, and which the hygienist must point out.

Lastly, there is a kind of preparation of some particular substances, which, on account of several fatal accidents, has called, of late, the attention of Administrations—I mean the coloration of certain cakes, and principally of some *Bon-bons*, with venomous matter. To innocuous vegetable colours, preparations of oxyde of copper, arsenic, chromate of lead, red oxyde of lead, sulphuret of mercury, have been substituted by pastry-cooks and confectioners,—most of those substances being, as it is known, very energetic and deleterious poisons, their use must be forbidden to avoid any frightful and possible consequences.

I could not, in such a limited space, give *in extenso* the list of the numberless items which man is exacting for his use and food, from either the animal, vegetable, or mineral kingdoms, and go through considerations upon each of them, as to their properties, qualities, alterations, &c., &c. ; or in other words, their fitness or unfitness for human consumption, without tediously repeating the same expressions and coming to the same conclusions. Having confined myself to the principal and most usual ones, I may be permitted to omit those of a secondary order, and to say now, to conclude this matter, a few words about the principal drinks, which, besides simple

either to quench the thirst, to assist the function of digestion, or to stimulate organisation after having pleased the taste.

Drinks may be divided into—not fermented, fermented, aromatic, and stimulant.

Water, having been the subject of a separate head, only beer, wines, and alcoholic liquors, as the most important, will now be summarily treated upon. When moderately indulged in, these fermented drinks seem to give strength and vigour to the animal tissues ; their immoderate use, to the contrary, relaxes and debilitates them. They cause more disorders in hot climates and in early life, than in cold countries and in a more advanced age. If indulged in with excess and very frequently, stomach or other digestive organic diseases are the common consequences, without excepting liver complaints or affections of the heart and brain. If now, with their standard qualities, when taken in inconsiderately, they are susceptible of becoming the origin of more or less curable disorders, how dreadful will not be the dangers kept in store by their alteration, adulteration, or sophistication, when, in such conditions, they are offered to consumers, who are not always possessed of discretion and conscious of their acts, while on the other hand, they cannot resist their fatal inclinations ? What they are unable to do for themselves, a wise and provident Administration must endeavour to obtain, in trying to remove, at all events, from their lips, the poisoned cup. There is no doubt, in fact, that very often, wines, beer, spirits, are sophisticated, and in such a way that they must necessarily be injurious to health. They are then, to be tested and rejected without the least consideration, when they do not exhibit those qualities which in natural and well treated produce are to be expected.

That is again the hygienist's duty, and a duty which, like

all others of the same kind, will promote him as the benefactor of the community at large.

CONSIDERATIONS UPON THE DEAD, THEIR INHUMATION, BURIAL GROUNDS, &c., &c.

The question of the dead bodies and of their inhumation may be treated under the three following heads : *First*, measures to be taken to protect the living against the chance of being buried as dead; *Secondly*, measures to ascertain the cause of death of deceased; *Thirdly*, measures intended to prevent the bodies of deceased from becoming injurious to public health.

First.—The frightful consequences of cases of inhumation of living men supposed to be dead must call the attention of Magistrates to such possible occurrences, owing to the sometimes very uncertain signs of real death. It would seem that putrefaction, as the less equivocal sign of death, should be expected to take place before proceeding to the burial formalities; but putrefaction is to be considered as a most certain sign of demise only when it is setting in over a certain extent of the body, and principally over the abdominal teguments; for putrid decomposition, in certain local diseases, may be met with in a living body, and in that case, patients are surrounded by cadaverous exhalations long before expiring. Putrefaction, then, is not always a sign of death, and persons strangers to medicine should not always take upon themselves the responsibility of a definite judgment. A certain time, however, must be elapsed before burying the dead, principally whenever demise comes in succession to any of those diseases which, more particularly than others, may be followed by the apparent signs of death

itself. Every complaint, the symptoms of which are essentially manifested by nervous accidents, are susceptible of producing an apparent state of death. Thus hysterical fits, hypochondriac affections, convulsions, catalepsy, tetanus, chorea, syncope, lethargy, immoderate exertions, considerable hemorrhage, may, as proved by great many cases, be followed by the temporary cessation of the vital phenomena. Any sudden death, likewise, must be accepted with doubt as to its reality, consequently the absence of the signs of life after submersion or strangulation, and consecutive to the effects of irrespirable gases, narcotic emanations, electric commotion, and cold, &c., &c., deserve a great deal of consideration and prudence: no attempts whatever, to stir up life again, should be neglected before inhumation, which ought to be necessarily delayed.

Secondly,—The measures to ascertain the causes of death may, at first sight, appear void of importance, but it is not the case though ; for, independently of giving correct statisticals upon mortality, they enable the hygienist to detect its real and immediate causes, and consequently to advise the Authorities about the best means to use in order to remove them.

Thirdly,—The measures intended to prevent the bodies of deceased from becoming injurious to public health cannot fail receiving the general approbation. If we consider the customs, habits and manners of peoples all over the world, we see striking differences due to the degree of their civilization, to their religious creeds, their laws, and other local and variable causes ; but there is a point which has been, and is always agreed upon by all societies, and that point is the religious respect to be paid with the honours of a sepulture to the mortal remains of men. That respect and duty spring out, no doubt, from moral sources, but other physical reasons compel the living man to clear from the surface of the earth the dead bodies of his fellow-creatures, and the fœtid stink of

putrefaction, with its dangers for the health, sufficiently explains the propriety of the measure.

In imitation of antiquity, some modern peoples are still burning their dead, and that custom, considered from an hygienic point of view, has not a few advantages over the other almost general mode of sepulture, the inhumation.

Inhumation takes generally place within enclosures called cemeteries or burial grounds, formerly situated all round the churches, in the very centre of towns ; the incessant progressive advance of hygienic science has, from the beginning of this century, pointed out the serious inconveniences arising thereof, and now they are generally placed out of towns, and as much as possible distant from habitations. Municipal Corporations must always take care that the graves are not too close each other, that they be at least six or seven feet deep, and that new ones should not be dug in the same places before a lapse of at least five years, after which period all the putrefaction process is certainly over ; wells, cisterns, water tanks, nearer than two hundred yards, should be suppressed, or people warned to reject their water for use or domestic purposes, lest it might be contaminated by filtration of impurities.

All what I have just written above is intended to give my readers a general notion of what is called public hygiene, the laws of which are to be adapted to large cities with regard to the preservation of public health.

I shall now consider in the second part of this paper whether the actual sanitary conditions of the City of Calcutta may bear comparison with those which I have attempted to describe in the first part, as necessarily required for the welfare and safety of the community at large.

PART II.

OWING to its geographical situation, under a tropical sun and on the banks of a river, to the nature of the soil it is built upon, to the bad conditions of its streets, the great number of its population, the immense quantity of produce and goods imported from the country and from abroad, to supply the wants of its extensive commerce and trade, and from the complete absence or ill-management of drainage and cleanliness, Calcutta may be considered as a most unhealthy place.

Any one wandering about certain circumscriptions of the city may satisfy himself that the air inhaled in his lungs is there in an almost constant state of vitiation, arising from emanations of all kinds, the stinking characters of which his olfactory organs will enable him to appreciate ; for my own part, as a medical man, I am quite satisfied, that one of the principal causes, if not the only one, of the fearful diseases breaking out now and then amongst the population of Calcutta, lies in the state of alteration of the atmospheric fluid. Consequently, I must say, that to secure the purity of the air and avert the causes of its alteration, the hygienist will have certain appropriate and practical measures to suggest. In the first place, the free circulation of the aerial fluid should occupy his attention. In the Southern part of the town, specially inhabited by Europeans, the streets, generally broad, open and free from encumbrance, and houses built at convenient distances from each other, allow the incessant renewal of the air, while, owing to their cleanliness and to the manners and customs of the people, there is but very little matter for vitiation or alteration.

During the South-West Monsoon, if impurities are found in the air, it is due to the effluvia of surrounding marshes and of the muddy banks of the Hooghly, given birth to by an intense heat, and blown in by the wind, but soon carried away. During the North-East one, on the other hand, the calm and still breeze, after passing over the Northern part of the city, inhabited by natives only, fetches with it, towards the South, a certain proportion of the vitiated air above alluded to. Comparatively, then, the South of Calcutta holds the advantage over the North, with respect to the salubrity of the air, and will hold it yet in a higher degree when native huts or dwellings, with all their filthy nuisances, shall have gradually disappeared, and when the system of drainage in way of execution shall have been completed.

The North portion of the town, to the contrary, as a whole, is but a vast aggregation of narrow and dirty streets and lanes, with half-ruined buildings, very seldom, or rather never cleaned; of filthy bazars of all kinds, where the circulation of the air is almost impossible, and where, consequently, its mass cannot be easily renewed. Moreover, the stench emanating from the side drains and kennels are due to gases, sulphured hydrogen, ammonia, and many others, the produce themselves of organic decomposition and of bodily excretions, combined with the strong exhalations arising from various industrial and other workshops and from infected water tanks, contribute a large share of atmospheric impurities, which the respiration of thousands of men and animals crowding both streets and houses tends continually to increase. Very dull indeed, and very gloomy, but yet incomplete picture! What is to be done, then, in presence of so many bad conditions—the most terrible foes of public health?

The houses should be cleaned, thoroughly repaired, white-washed at short intervals, streets cleared daily from all rubbish

and organic detritus, the drainage should be renewed or improved, water tanks filled up and levelled to the ground if corrupted and stinking, and the nuisances of bodily excretions forbidden and prevented under severe penalties. But all these important measures will prove insufficient, or almost useless, if a principal one is not resorted to. If the Calcutta Municipal Corporation are decidedly determined to do their best, and take every step towards the improvement of the sanitary conditions of that part of the city, let them not be deterred from the extent and cost of the work, but knock down houses and buildings, open new and broad streets, and create squares and large public places—then only, the vitiated atmospheric air will have its free circulation, and its morbific causes will be blown away by the predominant winds. How extravagant soever and impracticable this suggestion may appear for the present at least, I feel compelled to insist upon it, as the condition, *sine quâ non*, of the real improvement of the sanitary state of that portion of the town.

I could not fail to say that, in hot and dry days, and when water shall have been abundantly supplied, every street, road and public place should be watered to keep down the dust and cool the air.

To conclude, a last and most required step, important to both the citizens and crews of the numberless ships and country boats lying in the river, must be taken with regard to the unsatisfactory condition of its banks, the mud of which is uncovered to a large extent at low tide, and alters the purity of the air by its emanations, during the hot season principally. The nature of the works to be adopted and executed, it is left with the engineers to decide upon.

WATER SUPPLY.

As to the question now of the water for Calcutta, a few preliminary considerations are necessary. What are the qualities of the water hitherto supplied to the town, and its abundance, is it adequate to the wants of the population?

As far as my informations are correct, the water used for all domestic purposes, principally in the Southern division of the city, is obtained from the several tanks on the maidan and from those scattered about the town: most of them are simply filled up by rain water during the rainy season, and consequently their contents being gradually reduced, they are sometimes almost dried up, while only a few others, when on the eve of being exhausted, may be supplied again with water from the river through the aqueducts.

The rain water, as I stated above, owing to both its chemical composition and wholesomeness, is in every respect perfectly well adapted to the different wants of the inhabitants, and the water of nearly all public tanks in general is considered as the best procurable; but there are some others, and great many private ones principally, the water of which, polluted by abundant organic matters, sooner or later putrefying, is, of course, to be prudently rejected; it follows, consequently, that if the quantity of water gathered from season to season in all the tanks put together, were to be computed even approximately, the calculation would prove a negative and show a considerable deficit. It is then, necessarily, that the river water is resorted to, and mechanically forced into those tanks which may receive it through the water-conduits.

In the Northern division, on the other hand, where the tanks are very often inefficient, and the water unfit for use, the native community have no other alternative but to send for their supply direct to the banks of the river itself.

Such is the origin of the water, and the way how it is to be had actually in this city; but, on the whole, there is, *first*, insufficiency as stated, and *secondly*, very serious inconveniences from the impurities of all kinds held in solution or suspension in the water drawn from off the town.

Owing no doubt to these actual and unfavorable circumstances, the question, it appears, has already called the attention of the Magistrates, and Dr. Macnamara was accordingly instructed to treat it scientifically and to report upon the most favorable place wherefrom river water might be brought to town with better conditions of wholesomeness. From his repeated observations and careful analyses, at different times during the year, and at three different stations in the river, Dr. Macnamara's report must be considered as an authority, and his conclusions, I believe, have been finally accepted. The report having been published, I need not enter here into its particulars, but I will confine myself to remind my readers with the purport of his conclusions :—

First.—At Cossipore, during the greatest part of the year, the river water is unfit for domestic purposes, owing to the great proportion of its organic and inorganic impurities.

Second.—At Pultah Ghaut, its conditions are better, though not unexceptionable, yet with proper precautions as to the time of drawing it, it would afford a fairly wholesome supply for Calcutta.

Third.—At Chinsurah, in all times and circumstances, observation and chemical analysis have proved most satisfactory, and point out that station as the one to be preferred after that of the tanks of the maidan.

Consequently, as it is of all necessity to fill up the deficiency of the tanks, in justice to public health, the Chinsurah scheme had to be adopted, for leaving aside the qualities of the water, once admitted, it is beyond question, that with

regard to abundance, the supply will leave nothing to be desired, and, as I understand, the prompt execution of the scheme is contemplated, the citizens will at last rejoice in the welfare afforded by the copiousness and wholesomeness of so necessary and so indispensable an element; they will at the same time find themselves less exposed to those epidemical diseases breaking over the population, the causes of which may be found existing in bad water alone, or combined with others not less fatal.

Moreover, if confined to the first part of it, namely, the bringing the water into the town, the scheme would be incomplete. To crown its efficiency, water should be supplied through a system of metal water-pipes to every street and public place, and even to houses or establishments, at the cost and convenience of the landlords or tenants, alongside the river where, like in other places for watering or drinking purposes, fountains should be erected to supply the shipping with an inexhaustible and excellent water—a want so much and so long felt in this port. In conclusion, every one will, I am sure, agree with me, that these few propositions are also of the highest hygienic importance.

EATABLES.

To resume now the short exposition dwelt upon in the first part of this paper, about eatables in general, considered with regard to public hygiene, it remains, taking all what I have said as a comparative standard, to consider whether the town of Calcutta may boast of having nothing left desirable in that respect, to point out the defects, if any, and to suggest the means of reformation and amendment if possible.

Two races of men, very distinct from each other as to their manners and customs, have to find their food from the shops

or other establishments in the town. One feeding principally upon corn, rice, vegetables and fish, and the other, more specially, but not exclusively, upon the flesh of animals, corn and vegetables being also important items of his diet. Bazars, abundantly supplied, provide the former for all their wants, and in a comparatively good quality, while the latter, to the contrary, find no variety, or very little of wholesome quality in what is intended for their food. Every native has at his own door his rice and curry stuffs : every street is a kind of market place, where he is able to make his choice, according to what he requires and the amount of money he wishes to spend. In that respect, after due consideration, I see, for the present, nothing to blame or find fault with.

The Christian population, on the other hand, does not enjoy the same advantages ; feeding upon substances derived from both kingdoms, they have not always at hand all what they require, and are obliged to repair to some particular places where to get their eatables, very often unwholesome and sometimes injurious to health.

There are in Calcutta but two principal bazars or markets, the Dhurrumtollah bazar and the Tiretta bazar in Chitpore road ; in either of them, natives have hitherto monopolized every trade and speculation in the victualling department, keeping thus the people at their mercy and discretion, for, the quality and wholesomeness of the substances they are offering for sale, is no matter to them. During a certain period of the year, the articles of food to be had, there are not in a great variety, it is true, but in abundance, and a few of them of a fair quality, were not the rate of prices sometimes so exorbitant that every one cannot afford to pay for them. During the remaining months, on the other hand, there is even a less variety, and essentially

more inferior quality in the bazar produce. Now, if to such a state of things is added the characteristic uncleanliness of these bazars, where the sight of substances of every name and description, meat principally, fills the heart with disgust, where there is no water to wash away the dirt and filth, where the prompt decomposition of animal flesh, fish, fruits and vegetables is the cause of the alteration of the air, and where, at last, there is no ventilation—it is impossible to deny that, considered from an hygienic point of view, they leave much to be desired, and cannot stand comparison in any way with the markets of great European cities.

But this is not all; besides the bazar provisions, there are some other substances, intended for food, which are very commonly far from being possessed with the requisite qualities, either from essential alteration or from adulteration and sophistication, by dealers whose cupidity and dishonesty have no limit, and the repression of which is most earnestly wanted, to secure the protection of public health.

Butchers' Meat.—It is generally agreed in Calcutta, I believe, that in our bazaars, with the exception of two or three butchers' stalls, where meat of unexceptionable quality is daily exposed for sale, but at very high rates, and consequently supplied to a very small number of consumers, the others are not worth looking at, so disgusting is the sight of the unwholesome meat and garbage waiting for purchasers. It is not certainly necessary to be a very experienced judge, to perceive that such meat is obtained from cattle either attacked with disease, and which their owners, without consideration for the health of consumers, have sent in a hurry to the slaughtering places, in order to make the most of them, or which have not been properly fed, and have been subjected to an excessive work and fatigue; that veal, as another

ance, sold to the public, is generally provided from too ng animals, born in bad condition, very often killed ost immediately after birth, before acquiring a little more of ine in their substance, or losing any portion of their atine, and in order to allow the owners of cows to make most of their milk, as soon as possible.

s there no help for such a mischief? In a city like Calcutta, formation in that respect should be afforded, but with the greatest difficulty, though wanted most importantly for the sake public health. I will, therefore, venture to suggest a few measures concerning that matter to the favorable consideration of the Magistrates.

First.—Any meat pronounced of unwholesome quality and condition, by a competent judge appointed for that purpose, should be confiscated and rejected.

Second.—Every butcher or slaughterer should be compelled to take out a license, mentioning the place where his slaughtering-house is situated, in order to allow of the inspection of any authority.

Third.—That license, with all its privileges, should be forfeitable according to the breach of certain stipulated conditions.

Fourth.—Every head of cattle and pigs intended for slaughtering should be examined by the competent judge alluded to, and accepted or rejected, by him, as a wholesome or unwholesome article of food.

Fifth.—Too old and diseased animals should be rejected.

Sixth.—Calves should be allowed to be killed not until, at least, six weeks old—lambs or kids only after two.

A general slaughtering establishment, similar in every respect to those of most European towns, would certainly be the best plan to carry on with efficiency the above suggested propositions, and moreover, as a great desirable complement, European industry and speculation in that line of

business ought to be encouraged and supported by the community, as such a competition would, no doubt, lead to a fair and acceptable supply of meat.

With reference to poultry, game, and fish, similar regulations should be framed, as far as practicable and necessary.

Milk.—There can be no mistake that the milk supplied to the inhabitants of Calcutta by *doodwallahs* might be adulterated in more than one way, but it must be admitted also, that water alone is the most general sophistication resorted to; however much disgraceful and objectionable be such a practice, it does not constitute a real danger for health, and consequently it falls under the verge and control of the Police, who should receive instructions to check and punish such severely. I am not aware of any other fraud with regard to milk in this place, but by a careful observation, and inquiry, I would be able very soon to ascertain the fact and point out the means of detection. At all events, I would recommend that milk dealers should not be allowed to keep it, or carry it about in lead or brass vessels—any explanations thereon are, I believe, not required.

Bread Stuffs, &c., &c.—All what I have said already about flour in particular and other alimentary substances, such as vegetables, oils, spices, vinegar, and confectionery in general, if compared to what takes place in Calcutta, need no further consideration. Fraud, alteration, or sophistication exist in every degree in the preparation of bread; it is then incumbent upon the Administration to adopt proper measures, as above stated, against the treachery of bakers and the result which might be derived thereof.

DEAD BODIES, INHUMATION, BURNING, &c.

With regard to public hygiene, the question of the dead is not less interesting than the others for the town of Calcutta.