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REMARKS

UPON

THE DRAINAGE AND SEWAGE

OF

VALLETTA AND THE THREE CITIES.

“Sanitas Sanitatum, omnia Sanitas.”

MALTA,
August 1874.

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DRAINAGE OF MALTA.

In his most remarkable speech at Introductory. Manchester on April 4, 1872, our present Prime Minister, whilst stating his opinion as to the extreme necessity of public attention being concentrated on sanitary legislation, the attainment of pure air, pure water, the inspection of unhealthy habitations, the adulteration of food, and other kindred matters, illustrates his argument as follows: "A great scholar and a great wit 300 years ago, said, that in his opinion there was a great mistake in the Vulgate (which as you all know is the Latin translation of the Holy Scriptures), and that instead of saying Vanity of Vanities, all is Vanity—*Vanitas Vanitatum omnia Vanitas*,—the wise and witty king really said—*Sanitas Sanitatum omnia Sanitas*;"—and closes his remarks upon this head as follows: "Gentlemen, I cannot impress upon you too strongly any conviction of the importance of the legislature and society uniting together in the promotion

“ of sanitary measures and improvements.” Lord Derby in a speech on Medical Charities and Sanitary Reform at Bootle in August 1873, says : “ We want here broad streets, good
 “ drainage, plenty of light and plenty of air,
 “ these are our ‘ first requirements ’ and when
 “ we have obtained these, we want good and
 “ cleanly houses for our working men, we want
 “ baths and wash-houses, we want places of
 “ healthy exercise for those whose occupation is
 “ sedentary, we want places of rest and harmless
 “ amusement for all when their labour is done.
 “ In fact we ought to be living amongst a
 “ population, not squalid with dirt, not
 “ decimated by disease, but healthy in body and
 “ mind, living in homes which make self respect
 “ possible, and attached to a country which has
 “ done its duty towards them.”—Again, in his
 introductory lecture delivered in the University
 College, London, on May 10, 1871, Professor
 Corfield says : “ From its very nature, hygiene
 “ interests all classes of society, but it is to
 “ those who are worst off, the poorest and
 “ most wretched, that it must direct its first
 “ attention. Civilisation has its evils as well as
 “ its advantages, as Bourchardat has well
 “ observed, and one of the greatest of them, is
 “ the overcrowding of people in the great
 “ centres of population with the misery and
 “ disease which are the results of it. It is to

“ better constructed houses for the working
 “ classes, to a full supply of good water, and
 “ satisfactory sewerage arrangements, that we
 “ must look for an amelioration in these
 “ respects, and I would hasten to add, a wider
 “ spread amongst those classes, of such an
 “ education as shall lead them to appreciate
 “ the means used for the improvement of their
 “ condition, and lend a helping hand for the
 “ furtherance of these means ” — and he con-
 cludes with an appeal to his audience to keep
 in view the motto which they had adopted
 in the previous year,

“ Ad cædes hominum prisca amphitheatra patebant
 “ Ut longum discant vivere nostra patent.”

Now, the object of prefacing this little pamphlet with the above quotations, from these high authorities, on the importance of concentrating all our energies to obtain a good sanitary system, is, to invite public attention in Malta to some of the worst defects of our present sanitary system, and those which call for the earliest and most effective remedy ; and if we look back to Lord Derby's above quoted list of “ *first* requirements,” we shall find that we are sadly deficient in these, let alone the after requirements he mentions, viz: baths, wash-houses &c.; for instance, our streets are none too broad, we have not too much light in many of our dwelling-houses, we have not

Improvement of
 our sanitary
 system
 generally--
 Sewage and
 Drainage first.

plenty of air, nor have we a sufficient supply of pure water for the use of the inhabitants (though the quantity has been much increased of late years through the efforts of the Government and Council combined); and lastly, our actual system of drainage far from being good, is sadly defective, nay, very injurious to health; and indeed, the improvement of the drainage and sewage is the first undertaking we should take in hand; it is a radical evil, the cure of which should take precedence of all other sanitary improvement measures in Malta. And once that the attention of the public has been thoroughly aroused to this evil, the way will have been paved for future legislative measures to deal with it.

What has the Government of Malta done towards the improvement of the Sewage and Drainage.

Now, the very first question that every reader in Malta will here ask is this: and the Government of Malta, the paternal Government as it is generally called, what has it done? has the importance of such a grave sanitary question as this is, been overlooked? has the local Government been idly standing by and looking on without making an effort to improve these known defects and substitute a remedy with an increasing, nay, this year, doubled death rate? or has it been on the other hand as active and energetic as it should have been in bringing forward the consideration of these matters to the Home Authorities in the first instance,

who must unite in aiding to remove them (for they could not otherwise be dealt with by Malta single-handed)? in fact, has it done all that a Government could do, not only to represent a case that requires immediate treatment, but also to provide the method and means of putting it into execution, and doing away with acknowledged defects?

A short resumé of what has been done on this subject by the local Government, consecutively since the year 1865, will be the best reply to these questions. After the report made by Dr. Sutherland in that year on the sanitary condition of these Islands, Sir H. Storcks, the then Governor, gave his attention to the subject, and in 1866 commenced some sanitary improvements in the main sewers, by placing in them in various points of the town, at high levels and with a view of better ventilation to the sewers, several ventilating shafts, which were recommended by Dr. Ghio at that date, and with this view. This was the first step and earliest attempt to improve the sewage and drainage system, but the really practical move of importance made with regard to this subject, and which brought matters to an issue, was made by Sir Patrick Grant in the year 1867. In that year this most worthy and estimable Governor, very ably and clearly pointed out to the Duke of Buckingham, the actual condition

Resumé of the action of the Government in this matter.

Sir H. Storcks's ventilating shafts.

The really first important step taken by Sir Patrick Grant in 1867 in requesting the Secretary of State to send to Malta an experienced Civil Engineer from England.

of the sewage and drainage of Valletta, Floriana and the Three Cities showing the defects of construction, the intolerable nuisance of the surface outfalls, the want of due ventilation, the absence of connection of the sewers with the house drains, &c., &c.; and requested His Grace to send to Malta an experienced Civil Engineer to examine and report upon the subject.

Mr. Lawson, C.E., arrives in Malta and makes his first report.

With this request His Grace complied, and shortly after Mr. Lawson, C.E., arrived in Malta for this purpose. Mr. Lawson remained in Malta for some time, and made a thorough and comprehensive report upon the actual system of sewage and drainage, with plans and estimates for remedying its defects, by means of intercepting sewers, pumping arrangements &c. with a final discharge of the sewage into the open sea near Zurrigo. The estimate for the execution of Mr. Lawson's plan amounted to £ 85,000, but the Duke of Buckingham having observed that this estimate was made exclusive of the cost of the necessary water supply to flush the sewage, called for a second supplementary estimate of the sea water flushing supply, which amounted to £ 37,500 additional, plus £ 850 per annum cost of pumping. Indeed Mr. Lawson's scheme, since estimated by Sir A. Clarke, including house fittings (which were excluded in Mr.

Mr. Lawson's estimate of cost of works.

Sir A. Clarke's estimate of cost of Mr. Lawson's scheme.

Lawson's estimate) together with capitalization of cost of pumping, could not be taken under £ 200,000 and in this opinion Mr. Fowler, C.E., has since agreed.

Concurred in
by Mr. Fowler,
C.E.

Naturally the anticipation of such an outlay as this, staggered the Government, and led them to look to other sources, though it did not by any means cause them to relax their energies in dealing with this great subject and providing a remedy for it. They looked around therefore for some one capable of advising them in this emergency; and Mr. Andrews, C.E., attached to the Dockyard, and well conversant with Malta price of labour, was thereupon invited to estimate and report upon the cost of this work. Mr. Andrews did so, and sent in a scheme of his own which was a modification of Mr. Lawson's but with a different outlet and £ 25,000 less in amount.

Mr. Andrews
makes a
modified report
on Mr.
Lawson's
original
scheme.

Subsequently, for this amount was still too high for local means to defray even if the authorities at home would agree to contribute largely to the cost (which they had been in the mean time strongly urged to do by Sir Patrick Grant), Mr. Lawson and Mr. Andrews were invited to report jointly upon this subject, and their revised estimate for the drainage of Valletta and the Three Cities amounted to £ 66,937 17, besides £ 450 annual cost of pumping. But both these latter schemes were

Mr. Lawson
and Mr.
Andrews make
a third report
conjointly.

All three proposals considered to be too costly for the Government to undertake.

merely modifications of Mr. Lawson's first report, and they possessed these two fatal objections—difficulties of water supply, and an amount of cost far above the resources of the Island revenues,—and, to use a favourite formula of Sir Henry Storks, they were "*p.a.*" that is put away for future consideration, in fact, virtually dropped.

Colonel Mann's experiments with regard to the currents in Great Harbour and Marsamuscetto.

At this juncture Colonel Mann, R.E., C.B., who had all along taken the greatest interest in the sewage and drainage question, and specially so with a view of separating (if possible) the outfall of Valletta and Floriana from that of the Three Cities, and establishing the outfall of Valletta and Floriana in the deep sea at a point near St. Elmo, made several experiments by means of floats at various depths with a view of ascertaining whether the currents bore inwards into the harbours or outwards, but the result of these experiments was that from a point beyond St. Elmo, at which it was proposed to fix the point of discharge for the Valletta and Floriana drainage, the currents bore inwards into one or other of the harbours, and as far as these experiments showed, the sewage, if not all at least a considerable portion of it, would according to the point of discharge fixed upon, either find its way back into the Great Harbour, or that of the Marsamuscetto, but in either case,

whether the whole or a portion of the sewage would be brought back into the harbours, it was considered to be a very unfavourable symptom, that the currents drifted inwards, in as much as if it had been otherwise, and the currents had drifted outwards, the Valletta and Floriana drainage could have been taken "per se," instead of with that of the Three Cities, and a very large expenditure saved.

Up to this date then, between 1867 and October 1872, the Government of Malta had received no less than three reports on an improved system of sewage and drainage, all good and sufficient for the purpose, but possessing the fatal objection of excessive cost in proportion to the Island revenues to defray it; and even supposing that the modified scheme of Messrs. Lawson and Andrews for pumping salt water, omitting the drainage of certain villages and with an altered point of discharge into the sea, were carried out in a manner so as to produce a satisfactory result, still, even then this would involve a complete new system of house drainage and a total expenditure as large as from £160,000 to £180,000, which the Island revenues could not unaided afford.

A totally different mode of dealing with this question was now proposed by ~~Mr. Inglott~~, namely the application of the dry earth system

Application of
dry earth
system
proposed by
~~Mr. Inglott~~

The Duke of Buckingham

to Malta. There is, no doubt, much to be said in favour of this system, but its application to Malta is thus reviewed by Mr. Fowler.

Dry earth system as proposed by ~~Mr. Inglett~~.

“ In the peculiar circumstances of Malta
 “ and especially considering its small minimum
 “ rain-fall, it is not remarkable that the dry
 “ earth system should have received much
 “ consideration, and it appears that in one form
 “ or other it has been kept in view from the
 “ time of the Duke of Buckingham’s suggestion
 “ in 1868 to ~~Mr. Inglett’s proposal at the~~
 “ ~~present time~~. In the absence of any experience
 “ of applying the dry earth system to a
 “ population so large as that which has now to
 “ be dealt with, and from the fact of the habits
 “ of the people of Malta are unprepared for so
 “ great and sudden a change, I should shrink
 “ from recommending its application at the
 “ present time. However desirable such a plan
 “ might be, its introduction must be tentative,
 “ and a preliminary and gradual education must
 “ precede a comprehensive scheme. I consider
 “ however the conditions at Malta so peculiarly
 “ favourable to this system that I should
 “ strongly advise its early adoption for
 “ two or three of the largest Government
 “ establishments, and when the details are
 “ perfected and thoroughly understood that
 “ its adoption be extended to all the Government

Mr. Fowler's
 opinion on the
 expediency of
 adopting the
 dry earth
 system.

Recommends
 its adoption in
 two or three of
 the largest
 Government
 establishments.

The Duke of
 Buckingham

“ establishments. I have no doubt of its
 “ success under such circumstances and besides
 “ other advantages a considerable quantity of
 “ valuable fresh water will be saved and remain
 “ available for other purposes.”

Indeed Mr. Fowler's suggestions have in this respect been carried out by the Government: the dry earth principle has been already very successfully carried out in some of the Government institutions and is being introduced into others.

This advice has been partially followed.

The next in the field for the improvement of our drainage, and especially getting rid of one of the worst points in it, viz: the present obnoxious surface outfalls, by means of carrying iron pipes into deep water in the harbours at some distance from the shore and there depositing the sewage, is our indefatigable and zealous Admiral Superintendent, Admiral Inglefield.

Admiral Inglefield's plan.

On this proposal Mr. Fowler says: “It is well known that when sewage is brought into contact with salt water, chemical action takes place producing sulphurated hydrogen and consequently a most offensive smell, and in the hot weather of summer, this nuisance in the harbours must be almost intolerable, and there appears good ground for the belief which is generally entertained that sickness of a serious character is actually produced by it.” Mr. Fowler however goes on to say,—“the sugges-

Mr. Fowler's review of it.

Its advantages. “ tion of Admiral Inglefield is very ingenious
 “ and is founded on sound principles, namely
 “ that by carrying the discharge of the sewage
 “ into the deep part of the harbour, the nuisance
 “ would be greatly diminished as the solid and
 “ heavy matter would sink down to the
 “ bottom, and the other sewage impurities
 “ would be distributed and consequently diluted
 “ by its discharge into water far below the
 “ surface. If nothing more efficient could be
 “ done in a reasonable time and at a reasonable
 “ cost in Malta, it might be a serious question,
 “ whether even as a temporary expedient the
 “ plan of Admiral Inglefield should not be
 “ adopted. Although far from a complete and
 “ satisfactory remedy (as Admiral Inglefield
 “ is himself aware) it is nevertheless a
 “ mitigation of existing evils and has the
 “ advantage of being easily carried out at
 “ a smaller expense.”—Mr. Fowler goes on

Its defects.

to state the objections to this scheme as a real
 remedy, namely that it discharges all the solid
 fetid matter into the harbour to accumulate,
 and allows the liquid and lighter parts to ascend
 to the surface and become a constant and
 accumulating nuisance in the harbour.

Curious results
 of Admiral
 Inglefield's
 experiment
 after a trial of
 9 months, and
 since Mr.
 Fowler's report.

Before however quitting the subject of
 Admiral Inglefield's scheme, which is the last
 which has been made for the improvement of
 our sewage and drainage, it is as well to

mention here the result of an experiment made at the mouth of the iron pipe laid by Admiral Inglefield at the Marsamuschetto landing place after a trial of 9 months. Now, when Mr. Fowler made the above remarks they were made without the knowledge of this practical result of Admiral Inglefield's experiment after several months' trial, and his remarks were intended to refer to the principle rather than to its practice at any given locality, which indeed up to that date had not been tested.

The pipe fixed by Admiral Inglefield at the mouth of the Marsamucetto drain was fixed in August 14, 1873. A small portion of the pipe at the mouth of the outlet was substantially sound, but the remainder leading into deep water and extending about 108 feet from the point of junction was a mere temporary make shift, in fact an old wrought iron pipe considerably decayed when issued, and was temporarily placed to test the experiment of the preference of a deep sea outfall over that of a surface outfall. But, notwithstanding the faulty nature of this pipe, after a nine months' trial, during which 90 tons *per diem* of effluent sewage had been carried through it into deep water, on the diver being sent down to report upon the accumulation of the sewage, which was naturally supposed to have accumulated during that long period at the mouth of the

No accumulation of Sewage found at mouth of pipe after 9 months discharge of 90 tons per diem of effluent sewage.

Admiral Inglefield supposes an under-current outwards to exist.

If this supposition is correct it would alter whole character of Drainage and Sewage improvement works and save all unnecessary outlay of expenditure.

Mr. Fowler's plan.

sewer, the official report states, on the 17th March 1874,—“that no accumulation of sewage
 “ matter has taken place at the mouth of the
 “ pipe, when the depths therefore remain as
 “ reported on the 14th of August last.” This is a very remarkable fact and would tend to demonstrate that there must be, as Admiral Inglefield supposes, an under-current outwards which prevents accumulation at the mouth of this and other pipes similarly placed, and carries the heavy portion of the sewage out to sea. And if this is the case, then the question fairly arises whether Admiral Inglefield's plan might not be carried out at any rate for Valletta and Floriana and thus save a great outlay of money by enabling Valletta and its suburb to be separately dealt with that of the Three Cities.

The last proposition for improving the Malta sewage and drainage was made by Mr. Fowler, C.E., and which practically is the adoption of Admiral Inglefield's plan for carrying the effluent sewage into deep water into the harbours, combined with proper works to deprive it previously of solid matter and offensive smell. The following is Mr. Fowler's proposal:—

“ During the last few years a great
 “ number of sewage experiments have been
 “ made for large and small towns in various
 “ parts of England, and up to the present

“ time it may be stated that the general result
 “ is as follows :

“ 1st. That no difficulty exists in
 “ completely separating all solid matter from
 “ the sewage, and in removing offensive smells
 “ from the sewage water which remains.

“ 2nd. That to obtain a profitable
 “ return for the expense of such separation and
 “ defecation is at the present time difficult, if
 “ not impossible.

“ Applying this knowledge and experience
 “ to the special circumstances of Malta, and
 “ renewing the proposals which from time to
 “ time have been made, I am of opinion that a
 “ satisfactory remedy may be applied to the
 “ existing evils, so far as to avoid completely all
 “ nuisance in the harbours, or injury to health,
 “ by adopting Admiral Inglefield’s proposal for
 “ carrying the effluent sewage into deep water
 “ in the harbours, combined with proper
 “ works to deprive it previously of solid
 “ matter and offensive smell.

“ The means by which this would be
 “ accomplished are very simple.

“ I should construct intercepting sewers
 “ on the shores of the promontories of
 “ such length as would connect together
 “ a convenient number of the present
 “ discharging sewers, and then deliver their
 “ contents into a covered depositing chamber

“ or tank, situated in some convenient place
 “ near to the water’s edge.

“ In its approach to these chambers the
 “ sewage would be mixed with caustic lime and
 “ a small quantity of chloride of lime, which
 “ would produce complete defecation, and at the
 “ same time all the thick impurities would be
 “ rapidly precipitated and deposited in the
 “ bottom of the chambers. The clear water
 “ remaining would then flow away over weirs
 “ at the ends of the chambers, into cast iron
 “ pipes, and be carried down as proposed by
 “ Admiral Inglefield to a considerable depth
 “ below the surface water of the harbours.

“ In this manner the effluent water would
 “ cause no nuisance even in the hottest weather.

“ The next question is how to dispose of
 “ the semi-solid matter or sludge left in the
 “ chambers.

“ Experience has shewn that such material
 “ is of little or no practical value as a fertilising
 “ agent, since the cost of transport usually
 “ exceeds its money value as a manure.

“ In Malta it would be preferable in every
 “ respect that the sludge should be disposed
 “ of in the same manner as the offensive
 “ deposit now brought up by the dredging
 “ machines in the harbour, namely by taking
 “ it out to sea: but for a permanent arrange-
 “ ment, as in this case, a small steam hopper

“ barge should be specially designed for the
“ purpose.

“ This vessel (containing a centrifugal
“ pump to raise the sludge from the tank into
“ the barge) would be taken alongside a quay
“ near the tank or chamber, from which it was
“ intended to remove the sludge. A flexible
“ pipe connection would be made between the
“ pump centrifugal and the tank, and the
“ accumulated sludge in the latter would be
“ pumped up into the barge.

“ The sludge would be entirely free from
“ offensive smell, for experience has conclusively
“ shewn that after treatment with caustic lime
“ and chloride of lime, exposure to a hot sun for
“ several days will not produce any unpleasant
“ odour.

“ The steam barge having received its
“ charge, would then go out to sea, and on
“ arriving at a suitable place the sludge would
“ be discharged.

“ The tanks or chambers should be
“ arranged in pairs for alternate working.

“ In determining the requisite sizes of
“ tanks, I should consider it advisable to assume
“ a larger flow of sewage than that attributed
“ to each sewer in the return forwarded to me
“ from Malta, because the daily water supply,
“ and other circumstances indicate that the
“ average daily sewage should not be estimated

“ at less than from 6 to 7 gallons per head of
“ the population.

“ The tanks so designed will be of ample
“ capacity to deal with the sewage when
“ increased in quantity, by the addition of any
“ ordinary rainfall, and also to provide for the
“ accumulation of sludge if any exceptional
“ storm at sea makes it inconvenient for the
“ steamer to go outside. To provide for sudden
“ and abnormal storms it will be necessary to
“ supply each of the main sewers with a storm
“ outlet, of the class adopted for the same
“ purpose in the new main drainage system of
“ the metropolis.

“ For the intercepting sewers glazed
“ earthen-ware pipes may be adopted, and
“ arrangements should be made for flushing
“ them.

“ The exact positions of the intercepting
“ sewers, and of the tanks, are matters in
“ which the local authorities must be consulted,
“ but the data furnished to me shew that no
“ difficulty will be encountered.

“ I would venture, on the subject of
“ removal of nuisances from the harbour, to
“ suggest that the small steamer or barge
“ might probably be made available for the
“ collection, and removal to sea, of much of the
“ offensive solid and liquid matter now
“ discharged direct into the harbour from

“ large vessels constantly stationed at Malta.

“ I cannot but think this is a subject well

“ worthy of serious attention, and if adequate

“ provisions be made for the removal of all

“ nuisance discharged into the harbour from

“ sewers, the extension of the provision to

“ the vessels lying in the harbour, would be a

“ matter rather of regulations than of cost.

“ I entirely agree with Dr. Ghio as to the

“ necessity of ventilating the sewers, more

“ especially now that air tight traps have been

“ put into the streets, and I also agree with

“ him that this ventilation should take place

“ at all dead ends, and high parts of sewers,

“ and that the houses should be provided with

“ some kind of trap to their water closets,

“ however simple it may be in its character.

“ Further to prevent all chance of the

“ ventilating pipes being a source of danger to

“ the houses in the neighbourhood of which

“ they may be, I think it most desirable that

“ they should terminate in boxes having a store

“ of charcoal.

“ When the works described in this letter

“ (which may be accomplished in a short time,

“ and at a small cost) are carried out, and in full

“ operation, I have no doubt you will find

“ Malta in a sanitary condition in every respect

“ satisfactory.”

SUMMARY.

Five schemes
altogether—
which should
we adopt?

It will be seen therefore that there are no less than five schemes for the improvement of the sewage and drainage of Valletta, Floriana and the Three Cities: Mr. Lawson's, Mr. Andrews', Mr. Lawson and Mr. Andrews', Admiral Inglefield's, and Mr. Fowler's; the question that now remains for settlement is, which of these schemes ought we to adopt in order to best ensure the attainment of an improved drainage system, taking into consideration, before arriving at such decision, the means we actually possess, or may obtain, for the execution of the necessary works for this purpose. To form an accurate and not a partial judgment on this point, we ought first to ascertain which of these proposals deals best not with *one* only, but with *all* the defects of the present system, and setting aside for the moment the consideration of the cost of execution, let us see what the real defects of the present system are, and which it is our duty to remedy without further delay. Mr. Lawson in his report in 1857 made the following summary of these defects and they cannot be more graphically or more concisely described in each case.

Summary of
defects of
actual system.

“ 1. That the outlets of the main sewers
“ are into the practically stagnant waters of the
“ harbours and that the sewage is there kept in

“ a putrescent state, in the immediate neighbourhood of the towns.

“ 2. That the main sewers are all constructed of unsuitable materials, many of them are mal-formed, and some of them are inaccurately laid as to gradient, and therefore that they inefficiently answer their purpose.

“ 3. That the branch drains are similarly defective, and that the internal house-drainage arrangements, are at best imperfect, and in the lower class houses as bad as it is possible for them to be.”

Whatever scheme we may select, therefore, should comprehend the reform of the sewers, the outlets with their at present surface outfalls, the re-construction of the main sewers and the branch drains, together with the internal house-arrangements. Of the five above quoted schemes, the first three only deal with the whole scheme, Admiral Inglefield's and Mr. Fowler's also, only proposing to remedy the defects of the sewer outfalls. No doubt, of the three above quoted evils the surface sewer outfall is the most strikingly objectionable, and should, in any case, be the first to be dealt with, in as much as, the discharging the sewage into the almost stagnate water of the creeks and bays forming the harbours, 33 surface outfalls discharging into the Great Harbour and 8 into the Quarantine in the immediate vicinity

First 3 only deal with entire scheme of improvement.

33 outfalls into Great Harbour, 8 into Marsa-muscetto.

of the dwelling houses, not only causes a most intolerable stench (bad in winter and insupportable in summer time) but it also renders the condition of the several creeks, which thus become the recipient of all the refuse from the town, most prejudicial to health. And another strong reason for dealing with them first, is, that the remedy might be rapidly, and at a comparatively speaking moderate expense, applied.

But to limit the proposed reform of the sewage and drainage only to remedying the surface sewer outfalls, either by the adoption of Admiral Inglefield's or Mr. Fowler's more complete but more costly scheme on the same principle, would only be a half measure or rather a quarter measure; three fourths of the evils of the present system would still be left undealt with, and were no further remedy applied to these three fourths, the sanitary state of Valletta, Floriana and the Three Cities would be left almost in as bad a state as before. We have all board of "*suppositos ignes cineridoloso*"—but in our surface-clean but porous-stoned towns for "*ignes*" we must read "*faeces*," and unless the reconstruction and change of material of the main sewers, of the intercepting sewers and branch house-drains, is carried out, and that reformation is effected by the substitution of other materials than that of the present porous stone in which they are actually

constructed, the outlay, that it is now proposed to be made in the improvement of the sewage and drainage system, will have been, if not altogether thrown away, at least, the remedy that will have in such case been applied, will have been but a very partial one.

How shall we avail ourselves, then, most advantageously of the five schemes before us? Shall we adopt as we may think best, one or other of these schemes as a whole, or shall we better achieve that object by taking from one or other of them the best points in each, and amalgamating them in a new and sixth scheme?

In selecting the scheme to be carried out we must decide upon this important point.

In coming to a decision on this very important question, these two main points should be kept prominently before us, and separately considered and dealt with:

1st. The improvement of the actual system of the sewage and drainage of Valletta, Floriana and the Three Cities as a whole and complete work.

That is can we separate Valletta & Floriana from the 3 Cities, or must we take all together into one scheme?

2nd. The improvement of the sewage and drainage of Valletta and Floriana only, independent of that of the Three Cities, which should, under such circumstances, be dealt "per se."

A vast difference of expenditure will be the result of the selection of either of these two points; setting aside the two first schemes on the list, the original one of Mr. Lawson in

A great difference of cost if drainage improvement is carried out as a whole or partial work.

1857, and the modified scheme of Mr. Andrews on that of Mr. Lawson, as too expensive for any means that the Island can, even with assistance from the Imperial Government, bring to bear upon the execution of this work, we must still remember that the execution of the third comprehensive scheme, which provides a cure for all the defects of the present system, and which was proposed by Mr. Andrews and Mr. Lawson in their joint report, in October 1872, unites the drainage of Valletta and Floriana with that of the Three Cities, having an outfall at St. Rocco, and the cost of its execution, £ 66,907, with an annual cost of pumping (say £ 450) might, supposing the Imperial Government, in the Naval and Military interests of the Crown, were willing to pay, say, £ 30,000 towards the cost of execution, be managed to be made to fall within the resources of the Island, or, if the cost were not paid from the actual revenues, other sources might be made to be forthcoming to attain a result of such great sanitary importance in the best interests of Malta; and we should have carried out under such circumstances, a once for all and complete scheme, applicable to Valletta, Floriana and the Three Cities as well.

If Imperial Government would assist liberally the whole scheme a complete scheme might possibly be carried out.

Showing savings that could be made if Valletta & Floriana could be dealt with per se.

On the other hand, supposing (which has been already rumoured) that the Imperial Government would undertake the drainage and

sewage of the Three Cities at their cost, leaving the dealing with Valetta and Floriana to the local Government, a great saving in the expenditure of the total cost for these works would be at once effected; for instance, the construction of the great length of the sewer which would have to be made (were the comprehensive scheme of Mr. Lawson and Mr. Andrews carried out) to connect Valetta and Floriana with the other side of the water, with all the difficulties of level, want of fall, &c., &c., which now exist, would then be no longer needed, and a saving, of not only the cost of this sewer estimated at £ 6,641, but the pumping stations and other works at St. Elmo, estimated at £ 4,697, to flush it, might then be set aside—in all say £ 12,000—in addition to a further great saving in the annual cost of pumping (£ 450) would be effected.

The choice lies, therefore, between the adoption of the complete scheme of Mr. Lawson's and Mr. Andrews' in October 1872, which deals with the whole defects of the present system, which provides an united outfall for Valetta, Floriana and the Three Cities, a substitution of surface outfalls of *rain water* only into the creeks and harbours, instead of, as now, surface sewage outfalls, a new and different construction of main sewers, intercepting sewers and house drains; or, if this

Where the
choice lies.

scheme is set aside, of a separate and partial scheme, separating Valletta and Floriana from the Three Cities, and saving thereby a vast amount of cost in execution, but always leaving, whatever improvements may be made in the construction of the main sewer, intercepting sewers, house drains &c., the existence of the old and radical evil, namely, that the greater portion of the sewage *i. e.* that of Valletta and Floriana, will be poured into the harbours, either at a surface, or at a deep water level, as proposed in the plan of Admiral Inglefield.

Best scheme,
the complete
one of Messrs.
Lawson's &
Andrews, 5th
scheme.

We have to decide then on this very vital point, whether we should deal with the question of our sewage and drainage reform in a thoroughly comprehensive, or only in a more partial manner; in the first case, incurring no doubt a heavy outlay, but obtaining the object in view, in the second case, lessening that outlay, but at the cost of completeness. If we adopt Mr. Lawson's and Mr. Andrews' conjoint scheme, we shall adopt a scheme which will deal with the whole question of the improvement of the drainage and sewage of Valletta, Floriana and the Three Cities and at the same time remedy the three radical defects in the present system, pointed out by Mr. Lawson, in a complete and final manner; on the other hand, if we adopt any of the others, either as a whole or a part scheme, it becomes possible

to drain the Three Cities, and Valletta and Floriana separately, and at a much less outlay of expenditure, but certainly at a great sacrifice of unity and completeness.

To carry out Messrs. Lawson's and Andrews' Possibility of a sixth scheme. scheme, no doubt the revenues would have to be increased, as in the case of the late Postal subsidy; but, there now arises the possibility of a sixth scheme: namely, to adopt a less complete but far less costly course, and, in such case, a palliative not a complete measure, (but one under any circumstances vastly superior to the actual system), and which might be obtained at a very small cost, as far as the improvement of the sewer outfalls are concerned, viz: an amalgamation of Mr. Fowler's and Admiral Inglefield's scheme, deducting from the former the most expensive portion of the scheme *i. e.* that of the defecation of the sewage and the carrying out of the sludge by a steam barge outside the harbour, and retaining only Admiral Inglefield's plan of carrying the sewage into deep water by means of iron pipes, retaining also Mr. Fowler's intercepting sewers so as to lessen the number of pipes conveying the sewage into the harbours, and instead of having a pipe to each outfall to have only one for say 3 or 4 or 5 of the present outfalls (for instance the actual outfalls round Valletta and Floriana might, by intercepting sewers, be conveyed by

8 iron pipes only into deep water). The estimate of cost for this great improvement amounts only to 8,000*l.* which sum, includes the cost of making the intercepting sewers as also the cost of the iron pipes (8) leading into deep water. This, no doubt, would be a great improvement to the present system, but it cannot be considered to be as final and as complete a scheme as that of Messrs. Andrews and Lawson.

On the grounds of public health action should be taken in this matter.

But on sanitary grounds also it seems very desirable that active steps should be taken in this matter. The condition of the actual death rate, is sufficient to awaken the anxious attention of both Government and population, and so much is this the case, that the Government have already appointed a special commission of the Faculty to report upon its cause. Not only has the death rate throughout the current year doubled that of 1873, but it has now risen to the extraordinary high average of 52 per 1,000; and admitting that, on an analysis, the great majority of these deaths have occurred amongst children and persons of sixty years of age and upwards, still, the general death rate is excessive. In England by the last quarterly return of the Registrar General, in urban districts, as a rule, 22 per 1,000 die annually, while in rural districts the average is 19 per 1,000: now, mere density of population, such as

exists in Malta, need not be attended by such an excessive and abnormal death rate as ours is, when compared to this. The more limited the area, the greater care should be taken with regard to ventilation, removal of refuse, purity of water supply, and lastly sewage and drainage; now, out of the cases of mortality, which, under the head alone of *Enteritis* have reached in the last three months the number of 345, how many of them may not be classified as unnecessary and preventible? surely then, it is our bounden duty to neglect no precaution under police laws, improvement of ventilation, water supply, to ward off, as far as it lies in our power, preventible disease, and certainly, one should leave no stone unturned to put into early execution a work on which depends, more than any other, the future sanitary condition of these Islands, and the health, nay almost the existence of its inhabitants, and that is, the improvement of the sewage and drainage of Valletta, Floriana and the Three Cities.

Let us take care that we do not give the opportunity of allowing the saying attributed to one of the Popes, some centuries ago, to come home to us now—“*Quand il vous arrivera quelque grand malheur, examinez vous bien et vous verrez qu'il y aura toujours de votre faute.*”—If sanitary laws in Malta will vindicate themselves, and that they will do so

After dealing with Valletta Floriana and the 3 Cities we must look to improving the sewage and drainage of our "city lungs."

The best method to work upwards from sea level and then continuously carry out an entire system of sanitary improvement.

sooner or later, nothing is more certain, their standing motto being "*nemo me impune lacessit*," we shall not have far to go, to discover the guilty parties, for, the persons to blame will be ourselves. It is true that besides the reform in the sewage and drainage of Valletta, Floriana and the Three Cities, there is also that of our lungs, viz. Sliema, Pietà, Misida, Curmi, &c., to be dealt with; but, we must make a beginning, and that beginning should be made at the spot where the claims for reform date the longest, which are also, as the centres of the population, those which should be first dealt with. It would appear then, that the first step towards a great sanitary reform in Malta, should be made from the sea level and thus to work upwards, first a reform of the surface-sewer outfalls and carrying the sewage into deep water, or else and better still, outside the harbours; second, the gradual introduction of glazed pipes to replace the present over-spacious and porous-stoned drains; third, the connection of the house drains with the main drains, which might be made compulsory by a legislative act for that special purpose. Indeed, this third might take the place of second, and the connection of the house drains made with the actual drains at an early date. After these great sanitary improvements have been effected, then, the same course of

treatment to be made applicable to the "city lungs." Last of all, to effect such improvements in ventilation, purity of water-supply, removal of town nuisances, such as stables below the street level, overcrowding of lodging houses &c., &c., improvements, which the well known and admirable sanitary experience of the day, enjoins, nay, enforces elsewhere.

Malta, August 1874.