JOURNAL

OF

THE SELECT COUNCIL

OF THE

CITY OF PHILADELPHIA

FOR 1852-53:

BEGINNING OCTOBER 15, 1852,

AND

ENDING SEPTEMBER 29, 1853.

WITH AN APPENDIX.

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1853.

summer it might answer to have them open, yet in the fall and winter months, when night closes in at from five to six o'clock, there are many reasons which will occur to all, who will give it a moment's consideration, why the *previous lighting will be indispensable.*

As to Washington and Franklin Squares, they will be ready for opening in a few days, and the Committee are *much misrepresented* by those who suppose they have any interest or feeling in the matter, other than that which their *judgment* (in a duty especially assigned to them) and the wishes of their constituents may demand,—both of which they will at all times most cheerfully conform to. All of which is respectfully submitted.

A. G. WATERMAN, *Chairman.*
J. B. LANCASTER,
T. J. PERKINS,
D. B. HINMAN,
SAMUEL COPELAND,
ROBERT HUTCHINSON,
W. F. SMITH.

Committee Room, April 12, 1853.

APPENDIX No. LIV.

To the Select and Common Councils of the City of Philadelphia:

Philadelphia, May 7, 1853.

Various circumstances have delayed the present report far beyond the period when it was suppposed it might be laid before you. The inherent difficulty of the subject, the small amount of data to be had at the commencement of the examinations, the total want of an underground map of the City, rendered the most minute and tedious examinations necessary, and imposed an amount of labor and an expenditure of time, far beyond what was originally contemplated.

A further cause of delay arose from the fact that the examinations had to be made and the subject digested, in

such intervals of leisure as the ordinary routine of duties in the Surveyor's office permitted.

But little time can be obtained in the busy operations of an increasing City, to devote to so complicated a subject, and one requiring the most accurate information, and the most perfect adaptation in detail.

In the course of these examinations, frequent occasions have arisen in which the best authorities on the subject of drainage and sewerage were to be consulted, and some of their views will be embodied in the following pages, without deeming it necessary to refer explicitly to names.

In a previous report, occasion was taken to quote eminent transatlantic authority upon the views necessary to be taken, and the examinations essential to be made as the basis of a thorough system of drainage for a large and increasing City such as Philadelphia. As far as practicable these views have been acted upon, and no pains spared to carry them fully into practical operation, with what success, will appear in the course of this report.

The first great difficulty, (which was previously adverted to,) is the extremely plane surface of the City plat, naturally; a fault which has been increased by the earlier adopted gradients, there appearing to have been a constant effort to depress instead of to elevate a site that was already sufficiently low.

The inconveniences resulting from this desire to produce a level City, are very apparent when the subject of drainage comes to be considered; it imposes the necessity in order to insure perfect cleanliness, as well as security from partial inundations, that the whole operation of draining should be under ground, as far at least as this is capable of being accomplished; a point indeed on which the better writers insist in all localities and grades of level, but rendered absolute in our City, from the cause already mentioned, and from another to be now adverted to.

Practical men have laid it down as an axiom that no perfect system of drainage can be devised or carried out unless due reference be had to the natural water courses and features of the country. And to secure this perfection, such surveys and operations should not be limited by artificial boundaries. Under these rules then, for a finished system for Philadelphia, as it will exist a century hence, it would be necessary that the whole built limits from Germantown to

League Island, and including the entire fast land between the two rivers, should be taken into the survey and plan of operations.

This being, however, not within the scope or power of Councils, or of the duties confided to the City Surveyor, his examinations have been confined to the metes and bounds of the "*City Proper*," with a view to devise a scheme which should be as far as possible commensurate with the wants of that portion lying within the government of the City Councils.

This comparatively small portion of what may legitimately be designated "Philadelphia," lying between the Schuylkill and Delaware rivers, and bounded north by Vine and south by Cedar street, forms the only subject of our labors and enquiries.

Examinations of sewerage already made, have shown great deficiency in the amount now in existence, as well as great want of scientific principles in their projection and construction, resulting in practical inconvenience and inefficiency of the gravest character. In some places, as appeared in the course of the underground survey, culverts had been made of much greater volume on the higher grade than in that next the point of discharge, and the additional error committed of sinking them lower in elevation, so that the garbage which they were intended to carry off, has been collected at the head of the smaller culvert, forming an immense cess-pool of the most offensive character. Other defects were discovered, rendering a re-modeling and re-building to a large extent necessary to any near approach to a perfect system.

A thorough and proper drainage for such a city as Philadelphia, were the work to be commenced now, would be constructed on the following principles:—Taking the summit level and dividing ridge between the two rivers, the waters of which, in the last resort, are to carry off the *debris* of a population of half a million, culverts should be opened from or nearly even with the low water mark of both streams, extending along the main streets, and gradually decreasing in size, till they reach the topmost inlet on the summit. A diameter of seven feet at the outlet, on either river, is deemed amply sufficient for the passage of even the extremest floods to which our climate is subjected, which may be reduced to three feet at the highest point. The cross sewerage along the north and south streets would, of course, be of diminished

size, having reference to the requirements of the several localities, and estimating the different areas to be drained, it being understood that no street should be without a culvert, a perfect system of drainage not allowing that any gutter or kennel should cross any junction of two streets.

It is not supposed that the city authorities are prepared, at the present moment, to enter upon a system calling for so heavy an investment as would be required by the above proposition, and which embraces works for sewerage commensurate with the wants of the city for the next century.

True economy would indeed dictate that the expenditure should now be made, and that sewerage sufficient for the wants of a crowded population should be provided, in advance of the building of tenements or the paving of highways.

The millions of expense now thus incurred, would save tens of millions, long before the first year of the twentieth century dawns upon the millions of inhabitants, who will throng the banks of the Schuylkill and the Delaware at the opening of that era.

The undersigned limits his designs to what appears to be the immediate requirements of the time and the views of the Councils, keeping steadily in sight the permanence of whatever is done, and carrying his views on to the expected demands of the future.

The first steps to be taken were to determine the summit level of the area of the city proper, as well as to ascertain the extent of the superficial areas, and the amount of water and other wastage which they were likely to drain. In these researches particular reference has been had to the average quantity of rain falling in heavy storms, a liberal allowance of water for each inhabitant, and the amount likely to be thrown in by the adventitious use of it, as in conflagrations.

Upon a most accurate survey of the city plat, by a succession of levels, carefully taken, the summit was found to be on Broad street near to Chestnut street, which may be considered the dividing ridge between the two rivers. In accordance with the views already given, a system of culverts is proposed to be constructed, having Broad and Chestnut streets as the summit, with culverts of a capacity of three feet in diameter, and enlarging, as they are carried towards either river, by regular gradations to the point of debouchment.

The next and most troublesome problem to solve was the comparative size of the different basins or areas, the drainage

of which was to be conveyed at certain points throughout the city plat.

These have been estimated with the closest accuracy which careful surveys have been able to accomplish. The different colors in which these several areas are laid down, in the maps accompanying this report, distinctly mark the relative sewerage required for draining the areas indicated upon the plans or maps.

The general plan of drainage takes for its basis several classes of sewers, to be constructed as early as practicable, with a view to a permanent and complete system for the extent, under control of Councils. This looks to the abandonment of old culverts found utterly incompetent for their intended ends, and in some cases producing the very evils they were designed to avoid.

As a universal rule, no sewer should be constructed of less dimensions than three feet four and a-half inches in height, by two feet three inches, greatest diameter.

In the estimate of the quantity to be passed by any sewer, the following data have been assumed:—That each individual would consume fifty gallons of water per day, and to this has been added extra allowances for contingencies, including public baths, of ten gallons per diem for each individual. Assuming the population at two hundred inhabitants per acre, a full allowance it is deemed for the comparatively open population of Philadelphia.

The maximum quantity of rain has been estimated at one and a half inches per hour.

The necessity of baths and bathing places for the public, at little or no charge, cannot be too strongly insisted on, as connected with the hygiene of a city in such a latitude and climate as ours, as the free use of ablutions cannot be too largely encouraged, especially in a city so heavily devoted to manufactures as Philadelphia.

But with all these it is supposed that the estimate of wastage is sufficiently high for every purpose of comfort and convenience.

Sewers of the classes named are necessary for the perfect drainage of the streets; but in addition to these, for a good system, house drains of smaller dimensions, in most cases by iron pipes or earthenware, will be necessary to carry off beneath the surface, waste water from houses and water closets, to prevent the accumulation of garbage in summer,

as well as to obviate the obstructions on side walks, caused by freezing of upper drains in severe weather. This last may be considered as serious an evil as the putrefaction of garbage in the warmer weather, rendering many of the crossings at alleys and the gutters from small avenues at most times extremely inconvenient, and sometimes dangerous. Neither can be altogether removed, except by a system of drainage that shall convey, not only the wastage from the dwellings, but the rains from the roofs to the common sewer beneath the surface. The extent of this evil, and its fruitful source of annoyance, are manifested every winter.

In the construction of sewers heretofore, no reference appears to have been made to the pre-requisites stated, which are absolutely necessary in determining their dimensions. This has led to the error, in general, of making them unnecessarily large, and of course at increased expense. Although it is best in this particular to err on the safer side of liberal expenditure, there is no need of going widely beyond a fair calculation of the contingencies which may occur.

I could refer to instances in which at least half the expense of construction might have been saved, with the additional advantage of having the culvert more thoroughly cleansed by occasional heavy rains.

It is always to be kept in mind, that all these calculations are based upon a system of ventilation, without which, even sewers of greater dimensions, would fail to produce the end intended in their formation.

This ventilation should be in every case where it can be arrived at as high as the tops of the adjoining buildings, in order that the foul air should mingle with the atmosphere at an elevation above the ordinary inhalation of the inhabitants.

With the ventilation perfect, a sewer of 40½ inches in height, and 27 inches greatest diameter, of egg shape form, constructed according to the principles heretofore designated, is sufficient.

Care should be taken in all cases of new construction, that the inside bottom should be, wherever depth can be had, at least ten feet below the street paving, and all house drains at least three feet below the established surface; and this may be increased wherever it becomes necessary to drain the cellars.

Some of the old sewers, indeed most of them, should be cleansed without delay. From their impure condition, the inability of freeing them from deposits consequent upon their

original defective construction, and the almost entire want of ventilation, they have become highly impure, and the inhalations from some are of the most offensive and deleterious character.

Several should be entirely abandoned, their cavities cleansed out and filled with materials of less offensive description. Among these is the present Dock street sewer, from Third to Walnut street: it has from five to six feet of mud in it. A new one should be constructed north of the rail road, from Third to Walnut street. This old sewer has always been of defective construction, and has never thoroughly answered the purpose for which it was intended.

The same objection lies against the Delaware Fourth street sewer, from High street to Harmony Court. The old sewers extending from the east side of Delaware Fourth street, in a south-east direction to Franklin place, and through the lots between Hudson alley and Third street, uniting with the Dock street sewer, south of the Girard Bank, as likewise that extending from Delaware Fourth street, eastwardly, passsing under the building now being erected by Moses Thomas, Esq., and connecting with those just mentioned, should be abandoned, and a new system adopted, applied to the drainage of that entire section.

The extensive alterations and additions here suggested, will involve a heavy expenditure, and much lapse of time before their ultimate completion,—but they are judged absolutely necessary to secure the complete cleanliness and continued health of the City.

Whether we consider the subject in its bearings upon the comfort and condition of permanent residents, or as it may impress the stranger, whether a casual visitor or for continued habitation, it is alike important that both these considerations should have their influence.

Cleanliness and health are such almost necessary concomitants, that to whatever grade of animal existence we look for examples, we shall find them continually hand in hand, and when we rise in the scale to the human being, we find the necessity of the former as a preservative to the latter, claiming our highest regard. In dense populations, this great necessity is most imperatively demanded, as the evil results of its neglect fall not only upon the negligent, but in many cases extends to those entirely innocent.

All should therefore have the freest access to the most

unlimited means of promoting the general health, and in their use of these means, the most thorough system should be framed and enforced by the public authorities.

This has been conclusively shown to have the most beneficial results upon the general habits of cleanliness, as well as upon the health of a population. A good authority tells us that inquiries into the state of districts before and after improvements, have distinctly shown that increased facilities for the removal of refuse in and about the habitations of the poor, have been rapidly followed by a marked improvement in the health, and by a reduction in the rate of mortality of the district. An instance of this kind was observed in Manchester, by ascertaining the amount of deaths in twenty streets before and after their improvement, by which it was ascertained that the deaths immediately subsequent to the drainage and paving of the streets, were diminished more than twenty per cent. per annum.

In Liverpool, by the removal of cellar dwellings, the average duration of life has been increased; in Bradford and Bristol the same; and in the neighborhood of London, one physician lost his living by the arching over of an open sewer. In Leicester the average age of death in the drained districts is 24, while in the undrained districts it is 18. In the lowest districts of London, during the Cholera in 1849, the deaths were 1 in 118; in the highest districts the deaths were 1 in 347. And by the present system of sewerage the lowest and highest districts mean actually those badly and better drained; the means taken by the authorities to promote cleanliness and ensure health re-act beneficially upon the habits of the population, it being repeatedly observed, that a change for the better, in reference to cleanliness, has taken place among the people or inhabitants of any district rapidly following this careful attention of the authorities, to the great means of promoting the public comfort.

In cases of this kind the government has but to lead and the people rapidly follow; where these are too much neglected, the feelings of the people are in a measure blunted to all seeming decency, and from the constantly contaminated state of the atmosphere a vast amount of ill health prevails, leading to listlessness, and inducing a desire for spirits and opiates, the combined influence of the whole condition causing much loss of time, increasing poverty, and terminating the existence of many in premature death. In this way it cannot be ques-

tioned, that a careful attention to the purification of the air would be a material aid to the cause of temperance.

But it is scarcely necessary to insist further upon the absolute necessity of the preservation of the hygiene of a city, by providing an ample supply of pure water and air, and securing the removal of all *exuviæ* in the most perfect manner. The latter point should be gained, as now admitted by all authorities, as far as possible beneath the surface, and by a system as perfect as the present scientific views on the subject and its deep importance demands.

The plan of sewerage already submitted, and in some degree acted upon, will in time secure to the City proper every practicable benefit, if the system shall be carried out in the manner laid down and under one competent head; any departure from it in detail, unless under the sanction of scientific research and consideration, may very readily mar the general design, and by so doing materially interfere with its usefulness.

In the construction of sewers two points must be absolutely insisted on.

First.—That the egg shape should be invariably used, as by giving increased hydraulic depth to the run of water, and thus greatly increasing its power, its advantages have been so completely established over the old form, that the continued use of the latter is inexcusable.

Second.—That in no case should sewers or drains enter a main sewer at right angles, or in any other direction than that in which the sewerage is to be carried off, as a departure from this rule invariably causes an accumulation of filth at the mouth of the sewer at this entrance.

This system proposes, as one of its features, the gradual disuse of the old system of wall privies, by means of the introduction of water closets into dwellings as rapidly as the desires of the population shall demand. A proper equivalent for the use of the public sewers for this purpose may fairly be demanded, yet not at such high rates as would retard what is acknowledged a decided improvement upon the old plan of disposing of the *exuviæ* of a population. No one accustomed to the use of this comparatively modern improvement would ever consent to a return to the system now in use; it commends itself to favor in so many different ways, both in health and decency, that it is rather astonishing it makes way so slowly in a population so remarkable for general neatness

and propriety as that of Philadelphia. It is, however, daily obtaining favor, and with proper encouragement by the authorities would no doubt rapidly advance in practice.

Intimately connected as it is with the free use of water for private baths, it might be worthy of consideration whether increased facilities for this very necessary appendage to a dwelling might not be advantageously afforded, for the purpose of stimulating the exchange of the system of water closets for that of well privies.

Before, however, this can become universal, the system of sewers laid down in the accompanying plan must be completed, and too much energy cannot be urged in its prosecution.

The complete purification and ventilation of sewers is absolutely necessary to the perfection of such a system. The free use of water for bathing purposes will largely forward the first named object; and it is worthy of consideration, whether public baths, at very low rates, would not contribute to this end, as it would undoubtedly do to the health of the poorer classes, whose habits of cleanliness are much neglected by the total want of conveniences for bathing at their houses, and by the expense of bathing establishments, conjoined with the necessarily rigid restrictions from the free use of the adjoining rivers.

The ventilation of the sewers is a matter of grave importance, as has already been said, to secure their full capacity unimpaired, and also for freeing them from foul and offensive air. Various means have been suggested by which this important end may be attained with the least attending disadvantages.

Objection has already been made to those most customarily in use in our sewers, on account of their ejecting the vitiated air so nearly on a level with the breathing height in the atmosphere. Some writers propose making the chimney stacks of the houses the conducting medium, but this would scarcely answer in our climate, where fires are for so great a portion of the year intermitted, although in certain locations the chimneys of factories might be advantageously used for that purpose; as the action of the fire in destroying deleterious or noisome property in the rising effluvia is well known.

Where there are many furnaces there would be little expense, and need be no inconvenience in connecting each

large sewer with the ash pit of one of these furnaces, by which the foul air would be completely decomposed. The further operation of such a means would be to draw a continual current of fresh air through the sewers, tending doubtless to their purification; but this would not fully answer the purposes of ventilation.

The most efficient means appears to be the frequent introduction of flues into the sewers, carrying them to the tops of the adjacent buildings, either within the walls, or alongside of the water conduits from the roofs of the houses. A very simple mode of covering the purpose of them, in the latter case, would be by making them of sufficient capacity to surround the water, and let both enter the sewer together. This plan would avoid any unsightly appearance, at the same time that it would furnish an effectual discharge of the confined air above and beyond the inspiration of the inhabitants.

In connection with this there is a recent plan of ventilators proposed by Mr. Enoch Thorn, which might be advantageously used where the former plan could not be made available. Its great advantages consist in a discharge of the foul air during heavy floods, when its presence in the atmosphere would be least remarked, at the same, that it would effectually prevent the overflow of the inlets from the presence of confined air within the culvert. Although not so thorough in its operations as the perpetual openings by means of flues averaging in height the tops of the surrounding buildings. The peculiar features of Mr. Thorn's suggestion may be seen and readily understood, in a model now in the Surveyor's office.

There is another point in connection with the purification of the City by drainage, which is well worthy of consideration; it is the general ventilation of dwelling houses or streets, for the purpose of introducing currents of pure air, or of permitting the escape of that which is vitiated. This is a matter of great importance in considering the hygiene of the City. Too little care is taken in the erection of tenements especially for the poorer classes, to secure the access of a free current of air to their residences, by raising dwellings in the form of narrow confined buildings, crowded into obscure courts or confined alleys, calculated to pack together twice the number of human beings that should be collected in any given space. The evil influences of this pernicious system affects cleanliness of habits, and with it, general health,

to a degree but little estimated. When we consider that air is more necessary to life than food, that without a due supply of this first want of our nature, no food, however excellent and abundant in quality and quantity, can sustain health and strength, and that respiration in a large bulk of air, is next in importance to breathing a pure air, because it is necessary to the perfect performance of this function, that the air should enter into the lungs with a certain degree of force. And when we consider that in a large town with narrow streets, with still narrower alleys, close courts, &c., it is obvious that every circumstance is combined to vitiate the air, to prevent the escape of noxious gases, and to present what little respirable air remains in the form in which it is least fitted to answer the purposes of respiration." This is the testimony of a reputable physician,—and it may be added that a continued nauseous effluvia, is adverse to that free and full inspiration on which this authority places so much reliance for sound health.

A witness before the Commissioners into the state of large towns in England, in the year 1843, closes his testimony as follows:—"There are four primary objects to be kept in view in legislating for the comforts and accommodation, especially of the humbler classes of the community, namely: cheapness in the construction of their dwellings, and the several appendages necessary to make a working man's home comfortable; a plentiful supply of water at a cheap rate; *a sufficient sewerage and drainage at a reasonable cost;* and the promotion of ventilation. These, if properly carried out, would be of most essential service to the poor.

It may be taken as an axiom, that if you make the working man's home comfortable, he will give up the public house and its ruinous consequences; and that when a working man's home is little better than a pig-stye, that man will almost be an inhabitant of the tipling house or the beer shop."

Although but a portion of this testimony comes necessarily within the scope of this report, yet the whole subject is so intimately blended, and there is so much dependence of the one branch upon all the others, that a full and fair consideration of one can scarcely be had without taking the whole elements into the examination. And this must plead the excuse for the introduction into this report of matter, which,

at a hasty glance, might be considered irrelevant to the subject submitted to the City Surveyor.

Supposing the plans for sewerage here laid down to be completed, and all the necessary adjuncts suggested to its completion to be furnished, we might reasonably calculate that the health of our already highly favored City, would be enhanced by a considerably increased per centage in its favor over those of adjoining or neighboring Cities.

A recent statistical statement gives the following comparative data:

Philadelphia, - - - -	Rate of deaths,	1 in 2210
New York, - - - -	do	1 in 1214
Baltimore, - - - -	do	1 in 1828
Boston, - - - - -	do	1 in 1479
New Orleans, - - - -	do	1 in 928

It will be seen here that Philadelphia shows a heavy comparative degree of health to either of the Cities cited, and this is mainly attributable to the preventive measures already in force, which might be vastly improved by still further regulations, tending to remove the causes of disease, and promote the sanitary regulations of this metropolis.

The suggestions here made, are with a view to increase the interest already manifested on this most important subject—important alike as it regards the present health, or the future prospects of Philadelphia.

I have deemed it better thus hastily to lay before Councils the results of a long series of examinations, in the hope that they may be of service to my successor, rather than to avoid altogether the performance of a duty entailed upon me by the acceptance of an office for the perfect fulfilment of which, the highest amount of intellect and acquirements is necessary. My hope is, that the suggestions made in this hurried report, will be so improved upon and extended, as to furnish our beautiful City with a system of sewerage and drainage commensurate with its present and future consequence.

Respectfully submitted,

SAMUEL H. KNEASS,

City Surveyor.