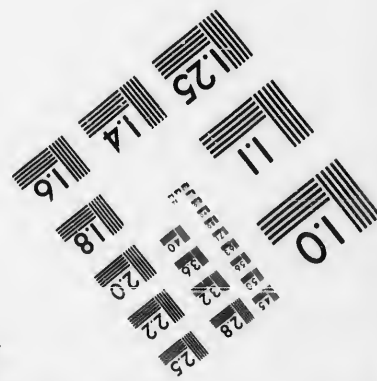
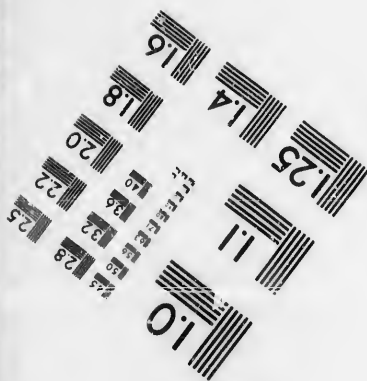
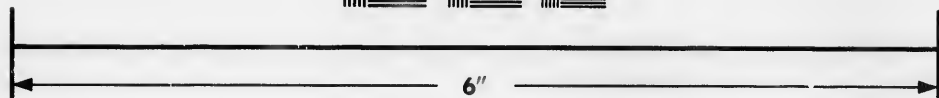
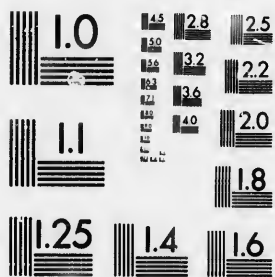


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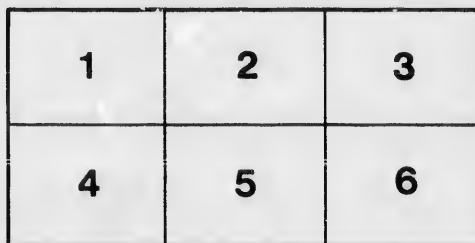
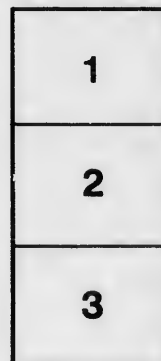
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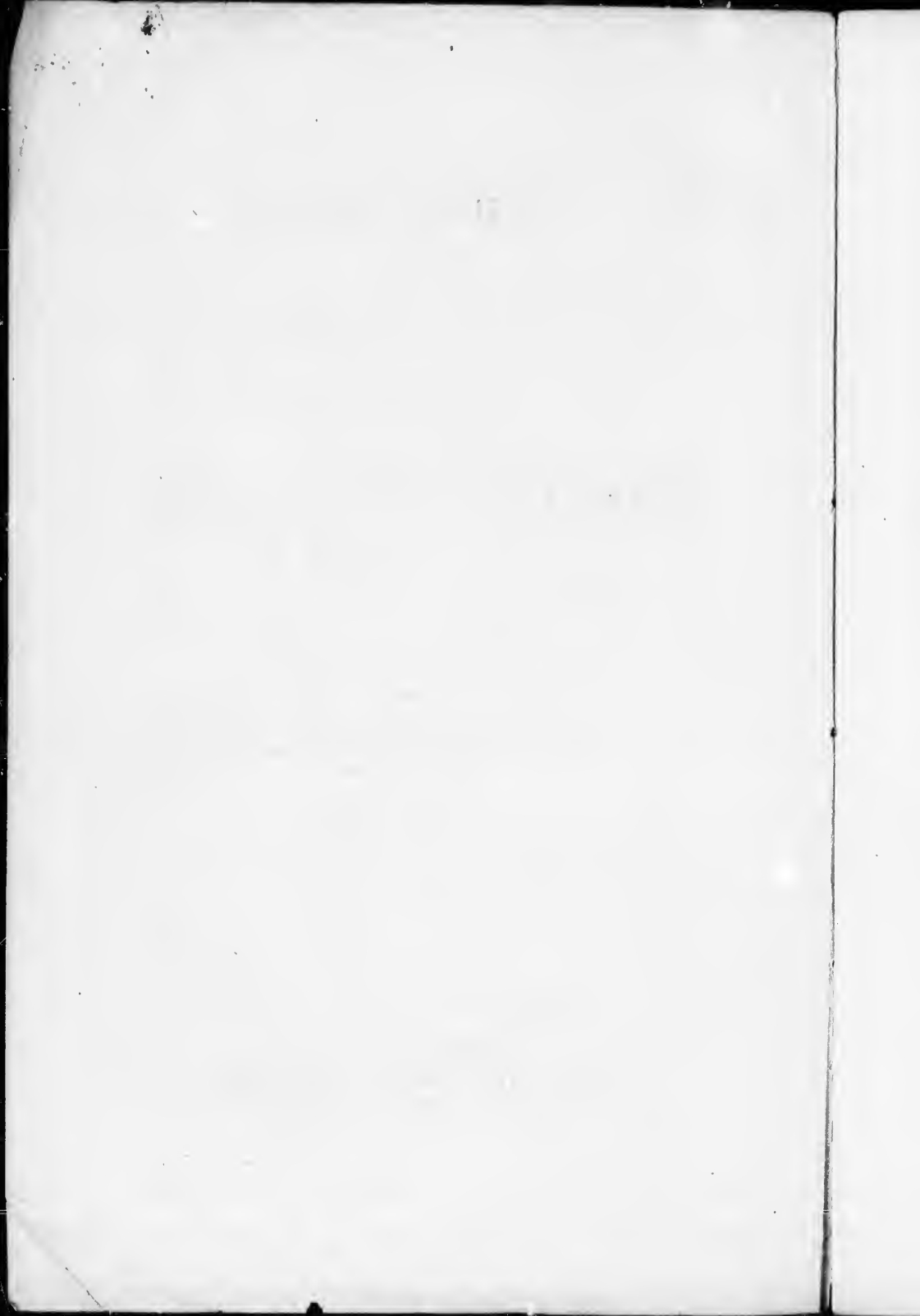
REPORT

ON

HALIFAX SEWERAGE.

Submitted to the City Council, February 7, 1866, and
ordered to be Published.

HALIFAX, N. S.
PRINTED BY JAMES BOWES & SONS.
1866.



REPORT ON SEWERAGE.

JOHN D. NASH, Esq.

Chairman of Street Committee.

Sir,—I beg herewith to submit Plans and Estimate for the Sewerage of the city.

The ground contemplated to be drained is bounded on the north by North Street; on the south by Inglis Street; on the east by the Harbor; and on the west by the Tower Road, Park, Bayer, and Agricola Streets—comprising about seventeen miles of streets.

The part of the city under consideration and above described is naturally divided into two grand water sheds, the principal one extending from North Street, on the north, to Blowers Street on the south, and divided on the west from the watershed of which the Fresh water river is the natural outlet, by Agricola, Bayer, and Park Streets, to the North west corner of the citadel; thence across the citadel to about midway between Barrack Street and Dredson Row on Sackville Street; thence, in the neighborhood of Blowers Street eastward to the harbor. The other watershed spoken of is the *minor* one. It is not so as regards the extent of country it drains, but as regards the amount of sewerage accommodation now required to be built.

The west end of Sackville Street and streets west of Queen Street are principally drained into the Freshwater River, through the sewer lately built through Mr. Letson's property and the Catholic cemetery. Pleasant Street from Morris Street, with the east end of South Street, Tobin, Young and Green Streets, are drained into the Freshwater river at the bridge.

East of Pleasant and Barrington Streets as far north as George Street, I propose to drain into minor outlets, taking advantage of the water thus supplied as far as possible to assist in the cleansing of the sewers in Water Street south of George Street.

I desired to avoid these small outlets, but could not do so without adding very materially to the expense; and from the small amount of water flow, expensive machinery for flushing and cleansing would have to be provided. As it is, by cutting the sewers into short pieces, and by taking advantage of the flow of water at command, I have been enabled to make this part of Water Street self-cleansing, besides doing away with some outlets.

The remaining part of Water Street, from George Street to North Street, is drained into two main outlets, one at Collins' and the other at the City Wharf south of the Dockyard. These outlets, from their taking the drainage of by far the largest part of the city, will have to be carried into deep water, and for this the two localities above named

are admirably adapted—the Collins Wharf at its outer end having about 25 feet at low water, and giving ample room for dredging in case such work should be required, and with only 40 feet past what is now permanently walled.

The outlet at the City Wharf will probably have to be carried something further.

The carrying of the sewage into deep water and into a locality that can be got at with a dredging machine is, I think, absolutely necessary, from the fact that we have but little idea of the amount of impurities that will be there emptied, in case the sewerage system is properly carried out in the houses and back yards; and, if such is not carried out, as far as the sanitary part of the work is concerned, the contemplated sewerage will be nearly useless.

Respecting the grades of the sewers, I have been enabled (with but few exceptions) by the natural grades of the streets, to keep the grades of the sewers at not less than 1 in 100, which grade with but a very moderate supply of water ensures a self-cleansing sewer. The only places at which the grades are less than 1 in 100 are between Cornwallis Street and Proctor's Lane on Brunswick Street, and between Proctor's Lane and the outlets at Collins' Wharf, and Proctor's Lane and the outlet at City Wharf, both on Water Street.

The sewer in Brunswick Street is graded at 1 in 157, and is 706 feet long. To ensure the self-cleansing of this, I have concentrated the drainage of Brunswick, Maitland, Gottingen, Creighton, and City Streets, north of Cornwallis Street, at this point.

To secure a similar result in Water Street, which has in two instances a fall of 1 in 240 (in a distance of 1610 feet in one instance, and of 1780 feet in the other) I have concentrated at Proctor's Lane all the drainage west of Barrack and Brunswick streets. A provision is also made that this water may be divided or diverted into both or either of the two outlets; and to do this is very important, inasmuch as in case of an extraordinary rain fall, such as we have once in two or three years, of from two to three inches in twelve hours, a sewer such as provided (four feet in diameter) would not vent it; but by dividing it we have two of that size, which will be amply sufficient; and in case of a long drought with but little water running, by turning all into one for a time, and then into the other, there will be no difficulty in keeping them both perfectly clean.

In carrying out this proposed system, I find there can be but little use made of the sewers now in Sackville, Prince, George, Duke and Buckingham Streets, as they convey the water directly down the hill: which are wanted to ensure the self-cleansing of the streets running north and south, they having much smaller grades.

PARK, BAYERS AND AGRICOLA STREETS.

The sewers in these streets are in short pieces, and of the smallest size, viz.: 2 feet by 1 foot 4 inches, and have two outlets, one in Cornwallis and the other in West Street. I may remark here that out-

ting a sewer into short pieces (as this is) has its objections, by necessitating what may be called dead ends, of which there are in this street four,—one at the junction of Agricola with North Street, two about the centre of Bayers Street, and one at the junction of Park Street with Cogswell Street. The objection is, that by commencing a sewer at a summit, there can be no surface water entering it, and there must necessarily be but very little water to keep it clean, and it may be necessary to have recourse occasionally to the Water Works supply by a hose. The advantage of these sewers is, that deep cutting (necessarily expensive) is avoided. I have, where possible, made such dead ends on the steep grades, where there will be no difficulty in keeping them clean.

There are a number of places where these dead ends occur in the low grades that may be avoided if the rock does not interfere, but the inconvenience attending them is not such that I should recommend a large outlay for the sole object of avoiding them.

CITY STREET

is drained by a sewer commencing at the summit of North Street, which is of the size marked No. 8 (2 ft. \times 1 ft. 4 in.), as far south as West Street, and from Cogswell to Faulkland Street; the remainder is No. 7 size (2 ft. 6 in. \times 1 ft. 8 in.) If the sewer now built in Faulkland Street is of sufficient capacity, the whole of City Street, with streets lying west, will be drained into it; and if not, that part lying north of Cornwallis Street will be drained into Cornwallis Street; but I would recommend the first, from the large concentration on Brunswick Street from Cornwallis Street to Proctor's Lane.

GOTTINGEN AND CREIGHTON STREETS.

These are similar to City Street, excepting that those parts of these streets laying north of Cornwallis Street will empty into Cornwallis Street, and the remainder into the Faulkland Street sewer.

MAITLAND STREET.

From its short extent, there is only needed a No. 8 size (2 ft. \times 1 ft. 4 in.), which empties the same as Gottingen and Creighton Streets.

BRUNSWICK STREET.

From North Street to Gerrish Street, No. 7 size (2 ft. 6 in. \times 1 ft. 8 in.); to Cornwallis Street, No. 6 size (3 ft. \times 2 ft.); to Proctor's Lane, No. 3 size (3 ft. diam.) My reasons for enlarging this sewer are:

At the north end there is a large space lying between this street and Gottingen Street, that until another opening is made between them, the Brunswick sewer will have to drain; and in case the fields north of North Street are built upon, this sewer may have to accommodate them.

From Cornwallis Street to Proctor's Lane, a distance of 700 feet, and with a grade of 1 in 157, the size is No. 3 (3 ft. diam.), consequent on the large concentration here to ensure self-cleansing.

LOCKMAN STREET

I have marked on the plan as draining into Cornwallis Street, and in the schedule and estimates as requiring 1400 feet No. 8 size (2 ft. \times 1 ft. 4 in.), and 1100 feet No. 7 size (2 ft. 6 in. \times 1 ft. 8 in.); but as there has been a sewer lately built from Cornwallis to Gerrish Street, it is more than likely that the 1100 feet of No. 7 size will not be required, and that part lying north of Gerrish Street will empty into the Gerrish Street drain.

WATER STREET.

From North Street to the outlet at the City wharf I have made No. 3 size (3 ft. diam.), as this sewer will have to be extended to the summit near the Hospital, and may be required to relieve the upper sewers in case of much extension north of North Street, which will also be prepared for such event.

From the outlet at City wharf to the outlet at Collins' wharf it is, as before stated, a distance of 3290 feet, with a grade of 1 in 240, drained by a sewer of No. 1 size (4 ft. diam.), made self-cleansing by the concentration of the sewage of the upper parts of the city in Proctor's Lane sewer, which, by diverging or dividing, will secure its not being overcharged, as well as in a dry time supplying sufficient water to keep it clear.

NORTH STREET.

Though shewn on the plan that the sewers are turned into streets running north and south as they reach them, which at present is the most advisable way, and which would only require a sewer of No. 9 size (1 ft. 6 in. diam.), yet there is no doubt, as before stated, more accommodation will be required at some future time. I have therefore made from the summit at Agricola Street to Gottingen Street No. 5 size (2 ft. diam.), and from Gottingen to Water Street No. 4 size (2 ft. 6 in. diam.)

DOCK YARD LANE

I have made No. 9 size (1 ft. 6 in. diam.)

GERRISH STREET.

Between Gottingen and Brunswick Streets, I have made No. 5 size (2 ft. diam.), and the remainder No. 9 size (1 ft. 6 in. diam.)

CORNWALLIS STREET.

From Brunswick to Lockman Street I have made No. 9 size (1 ft. 6 in. diam.), from Park to Gottingen Streets and from Lockman to Water Streets No. 5 size (2 ft. diam.), and from Gottingen to Brunswick Street No. 4 size (2 ft. 6 in. diam.)

FAULKLAND STREET

has from City Street to Gottingen Street a sewer of No. 5 size (2 ft. diam.), and from Gottingen to Brunswick Street No. 4 size (2 ft. 6 in. diam.) There is at present a sewer through this street, and running through Brunswick Lane and across Lockman Street

through the block to Brunswick Street, and through the Cunard property to Water Street. If that part of the sewer which lies west of Maitland Street is of sufficient capacity and keeps itself clear of obstructions, there will be no need of any further expense, except the trapping of the gratings; but as there will be required a sewer down from Maitland Street to Brunswick Street on the short street north of the Garrison Chapel grounds, I think, from the small extra expense, it will be better to divert the present sewer through this street.

COGSWELL STREET.

This has, I think, all the sewers needed: if not, sewers of No. 9 size (1 ft. 6 in. diam.) are all that will be required.

PROCTOR'S LANE.

From the large amount of sewage concentrated at this point, the sewer will be No. 2 size (3 ft. 6 in. diam.), and at its junction with the Water Street sewers will have a gate for the purpose of dividing the sewage as before stated.

The fall in this sewer is very great (about 1 in 10); and excepting in a rain fall of unusual magnitude (over 2 inches in 12 hours), this sewer will be sufficiently large. And to provide for such emergency, I propose making the Jacob Street sewer of sufficient capacity to accommodate the Barrack Street sewer, thereby, when required, relieving the Proctor's Lane sewer of the surface drainage of the Citadel, which is very considerable.

HURD'S LANE.

Until the site of the extension of Lockman Street is decided on, I cannot permanently fix on the best course to be here adopted, but have put in the schedule 250 feet of No. 9 size (1 ft. 6 in.) and 300 feet of No. 5 size (2 ft. diameter).

CUNARD STREET,

as also many other small streets, not before mentioned in this report, have No. 9 size (1 ft. 6 in.) sewers.

JACOB STREET,

to provide for any emergency, I connect with the Barrack Street sewer, as before stated, and made it of No. 5 and No. 4 (2 ft. diameter and 2 ft. 6 in.)

BARRACK STREET,

commencing at a dead end near Sackville Street, and emptying into Proctor's Lane sewer, is 1000 feet No. 9 size (2 ft. \times 1 ft. 4 in.), 1100 feet No. 7 (2 ft. 6 in. \times 1 ft. 8 in. diam.), and 520 feet No. 6 (3 ft. \times 2 ft.)

ALBERMARLE, GRAFTON, AND ARGYLE STREETS,

are very similar, commencing with dead ends, and emptying into the Jacob Street sewer, and are of No. 8 and No. 7 size (2 ft. \times 1 ft. 4 in. and 2 ft. 6 in. \times 1 ft. 8 in.)

BARRINGTON STREET.

The same as the streets last mentioned, excepting emptying into the Buckingham Street sewer.

GRANVILLE AND HOLLIS STREETS AND BEDFORD ROW.

To avoid deep cuttings I have made these to run to different outlets, some of the sewage being divided to assist the Water Street sewer between George and Sackville Streets, and are of Nos. 8 and 7 sizes (2 ft. \times 1 ft. 4 in. and 2 ft. 6 in. \times 1 ft. 8 in.) I have planned the sewers in these streets supposing rock bottom; but in case it is earth to a sufficient depth, I would recommend some alterations, so as to make more use of the sewage for cleansing purposes.

SACKVILLE, PRINCE, GEORGE, DUKE AND BUCKINGHAM STREETS.

These have now large sewers in very good repair, excepting the lower end of Prince Street. The misfortune is that there was so much money spent on them. They were built of a sufficient height and width for workmen to go inside either to cleanse or repair them, whilst the grades are such (until they reach Water Street) that it is utterly impossible for anything getting into them to lodge, and require cleansing. At Water Street the grades were carried so low that from their style of construction they have always proved a source of trouble and expense.

The present Prince Street sewer, from Bedford Row to Water Street outlet, is in a very dangerous condition, the side walls being for some distance totally gone, with nothing but the arch remaining to hold up the street.

The retaining of the above last mentioned sewers in my proposed system will not lessen the expense of those sewers running north and south; and as the water running in them is required for the cleansing of the north and south sewers, I have considered it necessary to divert them as shewn by the plan. In the schedule, I have placed for these sewers Nos. 9 and 5 sizes (1 ft. 6 in.) and (2 ft.) These to a considerable extent will not be needed, as between the north and south running streets the present sewers may stand, and by damming (though not so complete), the divergences can be made.

WATER STREET.

From Proctor's Lane to Collins's wharf, a distance of 1780 feet, with a grade of 1 in 240, No. 1 size (4 ft. diam.)—cleansing secured as before stated; south of Collins's wharf the sewer is cut up into short sections, and has for outlets those now in use at Prince Street, Noble's wharf, Salter Street and Hart's wharf. From not having a sufficient supply of water at command to make one main sewer with the outlet at Collins's wharf, I thought it better to increase the grades and make use of these outlets; though I must here remark I am not satisfied with the distribution. Having so many outlets (though they are small) is decidedly objectionable.

SACKVILLE STREET,

west of the summit, is of class No. 9 (1 ft. 6 in.), emptying into the head of the Birmingham Street sewer and into the Park Street at the south-west corner of the Citadel.

QUEEN STREET

is about the dividing line of the Harbor water shed and the Freshwater River water shed. The drainage of this street is each way from the Artillery Park and Fort Massey into the Morris Street sewer. There is now a square stone sewer built from Morris Street to near the Spring Garden Road, which at its junction with Morris Street is of a depth of 15 or 16 feet, the expense of which could have been avoided by making the outlet through Dundonald Street into the Morris Street sewer, and this course would give much superior grades and with only the ordinary cutting of 7 feet; but if the present sewer does its work, it would be folly to go to any expense to change it; though when the Dundonald Street sewer comes to be built, if there be any doubts of the efficiency of the present Queen Street sewer, the Dundonald Street sewer should be made of a larger size than I have given in the schedule (2 ft. \times 1 ft. 4 in.)

SPRING GARDEN ROAD,

with the other streets west of Queen street, are drained into the Freshwater River, through the 3-foot brick sewer lately built through Letson's property and the Cemetery. These sewers are of sizes used in similar cases in other parts of the city.

That portion of Spring Garden Road east of Queen Street and Salter Street have now a sewer, which, if deep enough, will no doubt do, the grades being such that almost any kind of sewer would be self-cleansing.

MORRIS STREET,

from the summit, a short distance west of Queen Street, is drained into Water Street, affording a considerable supply of water, which may be made of more use in cleansing the Water Street sewer than I have at present planned.

There are about 600 feet now built of stone sewer, which will no doubt be available. The remainder is of No. 8 and No. 7 sizes (2 ft. \times 1 ft. 4 in. and 2 ft. 6 in. \times 1 ft. 8 in.)

PLEASANT STREET,

south of Morris Street, is drained into the Freshwater River at the bridge, and is of Nos. 8, 7 and 6 sizes (2 ft. \times 1 ft. 4 in., 2 ft. 6 in. \times 1 ft. 8 in. and 3 ft. \times 2 ft.), receiving the drains of the east end of South Street, with Tobin, Young and Green Streets. There is now here some description of a sewer which may possibly be used.

INGLIS STREET AND ARTZ STREETS

receive the different sewers in Smith's Fields, and of the ordinary sizes.

From the foregoing description, you will readily understand my plans and reasons. The sewers are smaller than recommended by

some engineers and larger than those recommended by others. From the favorable nature of the general contour of the surface to be drained, thereby allowing divergences to be made in case of emergency, I have made the main sewers smaller than I otherwise would have done. In this there are two objects gained—

1st. Less expense.

2nd. In a dry time with but little water running, large sewers are very apt to fill up, whilst by the present arrangement the main sewers are kept moderately small, and in case of an extraordinary rain fall they can to a great extent be relieved of the burden.

I have also in the present arrangement avoided any very deep cuttings.

There are in all about 17 miles of sewer, affording ample sewerage for the houses and streets in the district described, and providing for extension where extension is possible; and if any new streets are made, the sewers to drain them will only be branches to those now proposed.

GRADES.

Respecting the grades in this City, there is no room for discussion, there being no grades less than what are acknowledged by all Engineers as sufficient for all the purposes of good drainage.

DEPTHS.

This subject has given me a great deal of anxious consideration. I have had a large number of the cellars in different parts of the City measured as to their depths, and this on both sides of the streets. I have come to the conclusion that it would be utterly impossible to attempt to drain the cellars of the Houses on the lower sides of the streets into the street drains, some of them being 18 feet below the surface; and besides, from the fact that in the central part of the City the difference of level of the streets running North and South is 20ft., and in some places more, and by the natural fall of 10ft. to the centre of the blocks (a distance of about 90 feet) where the cesspits are principally located, and they at a depth of some three or four feet, this with the fall required of not less than one in forty-five and fifty, with twelve inches, which the pipe sewers should be above the bottom of the main, making in all a depth of seventeen feet, and in a district with a rock bottom like this City, would be absurd,—as the same end can be attained in a much cheaper way, of which I shall speak hereafter.

After coming to the above conclusion, and having got the depth of a large number of the cellars, I found that whilst a depth of seven feet was amply sufficient for street purposes and for by far the largest number of cellars, on the upper sides of the streets, yet it would not be deep enough for all; but when it is taken into consideration that any increased depth must be counted as all rock cutting, and that a depth of seven feet is sufficient for all other purposes, I am of opinion that the average depth of seven feet is the best I can recommend.

The inability to drain the lowest cellars is, I am aware, an objection,

but the difficulty is not as great as would at first be imagined. The house drainage from the sinks, the eaves, and the surface of the back yards, can all be delivered at the contemplated depth, leaving but little water to find its way into the cellars; and this, if found troublesome, could be obviated by making the cellar water-tight.

An eminent engineer says: "we are satisfied that the fullest investigation into this subject will establish the principle that no sewage matters of any kind should be allowed to be discharged into a drain from any rooms or apartments below the surface of the ground."

CATCH PITS.

Of these there will be required about four hundred. I have made plans of two kinds, either of which will answer. I propose them to be three feet in diameter and six feet deep. They will require to be frost and drought proof, having both to contend with. It is a matter of some consideration as to what form of catch pit will suit best. The most simple plan is for the pipe, after leaving the pit, to rise to a higher level, so that the water in the pit will always be above the mouth of the pipe. The difficulty in this is the frost; and to obviate this I have no grating, and instead a piece of about four inches wide and two and a half feet long, cut out of the lower part of the curb stone. This kind of opening is very much used in the street drains of Boston and New York.

The other plan has an ordinary grating, but the trap is the ordinary inverted syphon drain pipe; this the frost would not injure unless it penetrated to the syphon, which it would not be likely to do.

I think the former plan preferable, as from it any thing that could get into the pipe would find its way into the sewer, whilst with the second the syphon might be stopped.

MAN-HOLES.

Of these there will be required about one hundred. They will be required of different sizes, and may be used as ventilators.

VENTILATION.

By having all the inlets trapped, it will become necessary to provide for this; for unless there is some mode of escape for the gasses they will certainly find their way into the houses, notwithstanding all the trapping that may be done. To accomplish this, I propose two methods, both of which will have to be used, one by small gratings in the man-holes in the centre of the streets, the other by the gutter pipes of the highest houses. By using the two, as best suited, I have no doubt this object will be attained.

HOUSE DRAINS.

This I consider the most important of the whole service; and if not carefully and thoroughly carried out the street sewers will be of little use.

It has been a matter of dispute as to what should be allowed to pass into the sewers, and whether night soil should not be turned to some more useful purpose. At the present time I believe there is a law against the use of Water Closets in this City, but I think this is not on

account of the value of night soil as a manure, so much as its offensiveness; and in the present state of the sewers such a practice would become very offensive indeed; but as the proposed sewers are intended to be air tight, and to carry the sewage into deep water, I think that such objection may be said to be overcome. As night soil is not at present valued by farmers, it costs the householder \$4.00 a load to get rid of it. Under these circumstances, we may come to conclusion, that in this City the best mode of getting rid of it is by the sewers where practicable; and where water closets can be used, they will decidedly answer the intended purpose, but they will be a dangerous experiment, excepting where they will be free from frost, and with a liberal supply of water, and they should also connect with the house drain after all the other supplies to it have been received, so as to insure a sufficient supply of water to carry it quickly into the street sewer, and must only be used by such people as are able and willing to keep them always in good working order. Under other circumstances, closets can only prove a source of annoyance.

In this City for a long time the old cesspool must be depended upon, which by proper management and drainage may be made perfectly inoffensive.

In treating on the depths of sewers, I shewed the impossibility of draining houses on the lower sides of the streets into the street drain, and to supply the difficulty a system of back drainage must be resorted to. This consists in running through the back yards a large pipe sewer of twelve or fifteen inches diameter, as may be required, and connecting this with the nearest main sewer. This pipe, by turning all the available water into it, will ensure its not fouling. These pipes being connected by smaller ones (properly trapped) with the cess pools, house sinks, and cave pipes, insure a cheap and perfect drainage. The cess pools must be built water tight, so as to prevent the escape of their contents, and also to prevent the ingress of surface water. Their having a pipe with a proper grating to prevent the solid matter from getting into them, will leave such matter in a shape that can be easily managed, and by the use of a small quantity of ashes can be made perfectly inodorous, and will supply a most valuable manure, that should be taken away by the farmer without expense to the householders.

It should be made imperative by law that every house be properly drained, and that, under the control of the sewerage engineer; for unless this is thoroughly and properly done, the street sewerage in a sanitary point of view will be valueless.

The present state of the house drainage is such as but few can imagine. The only effective sewers running the short way of the blocks leaves the middle portions of them literally without any means of drainage. The consequence is that a cess pool is made for a privy, into which collects all the water that it will contain. If partly in rock, it is kept full to the top of the rock, and above this it finds its way through the soil until the whole ground in many parts of the city is neither

more nor less than one great cesspool. And this, together with the apathy of a great many of the householders, and the difficulty of getting good drainage, and the heavy expenses and disgusting mode of getting night soil removed, is only what might be expected. Nothing but a comprehensive act, rigidly carried out, can remove the difficulty.

I may here state, that it will not be necessary to wait until the street sewers are built, to commence this improvement. Such cesspools may be built as soon as the spring opens. The present cesspools can be cleaned out, and such as I have described put into their places, the drain pipe put in and plugged with wood, and by the use of ashes can be kept perfectly inodorous, and the contents removed with little difficulty. Also the present gratings may be removed, and such as I have suggested put into their places, with but little more expense than if put in at the time the sewer was built.

I must here remark, that covering the present gratings, or making the above substitutions in their places, can only be done to a limited extent, until after other ventilation is provided for: the gases constantly engendering in the sewers will find vent somewhere, and if repressed on the streets, will be driven into the houses, even although the house drains be trapped, which but few are.

Such sewers as the Albermarle, Grafton and Argyle street sewers could be built and emptied into the present Jacob street sewer, and many other portions of the city could be dealt with in the same way. By such a mode of procedure all, or nearly all, of the more densely populated portions of the city could be put into a fair sanitary condition in the course of the summer.

In anticipation of a thorough cleansing of the cesspools in the spring, I have asked Alderman Chipman, who kindly consented, to ascertain for me, through his agents in London, the expense of a pump used there for pumping the contents of cesspools into the sewers or tanks on wheels, by which means they can be emptied at a largely reduced cost, and with but little of the disagreeable escape of gases now made.

I think there can be but little done in the way of flushing the present sewers—those lying east and west, from their heavy grades, being as clean as can be made, while those lying north and south are completely filled up, in most cases, and built square, of stone, and rough: so that probably it will be found impossible to clean them in any other way than to open them and cart the deposit away; and if they could be cleaned by flushing, the deposit would lodge in many cases in Water street, where it would be more difficult to get rid of than in its present position. At the same time, there is no doubt in some cases flushing would be partially successful.

COST.

In making up an estimate of the cost, I have taken the present price of material, which is, however, much larger than known in any other country of which I have any knowledge, this being to some extent occasioned by the hitherto limited demand.

When it is known that a large portion of the brick used for building

in this city has been imported from New Brunswick and elsewhere, the cost of importation being equal to \$5.00 per thousand, besides the ten per cent. duty: in the face of all this can it be doubted (here where all the material for brick-making is in such abundance, costing literally nothing, where fuel is cheaper and wages no higher than in the places whence the bricks are imported,) that bricks can be made here as cheaply as in other places, now that the demand is so large; and more particularly since, if the building of the sewers is proceeded with, a large quantity will be also required by householders for cesspools.

DRAIN PIPES.—The present prices per yard are, for

9 inch diameter	\$1.00
12 inch, "	1.50
15 inch, "	2.85

Whilst in Rugby, England,

9 inch, diameter is	\$0.28
12 inch, "	0.46
15 inch, "	0.75

In Glasgow,

9 inch, diameter is	\$0.25
12 inch, "	0.32
18 inch, "	0.50

Pipes of fire clay, in Glasgow, 12 inch. 0.57

I do not expect that pipes can be made here at these prices, labour being so much higher. But we have close at hand an abundance of material, both of ordinary clay, such as the cheaper of the Glasgow pipe is made, and also of fire clay, of which at the different coal mines of the Province thousands of tons have to be brought out of the pits and thrown away, and this more particularly at the Cumberland mines, where such large quantities have to be removed with the coal, that the disposal of it becomes very troublesome. Notwithstanding all this, nine tenths of all the fire brick and such material are imported. When it is taken into consideration that there will be wanted for the house drainage, independent of what is wanted in the streets, between 50 and 60 miles of this pipe, can it be doubted but that under these circumstances a very material reduction will be made on the present prices?

LIMES AND CEMENTS.

In a country like this, where limestone abounds, and where it is accessible by water, and within twenty-five miles of the city by rail, in inexhaustible quantities, is it not astonishing that there is so much imported? And as for hydraulic, or "water lime," where we have so many beds of limestone occurring in such geological positions and of such varied composition, it cannot be doubted but many good hydraulic cements may exist and be supplied at half the price of cements which I have estimated at \$4 per barrel.

Taking these things into consideration, I thought best in addition to my estimate at present prices to make one at what I consider a reasonable reduction consequent on the magnitude of the contracts as well as the lower price of material.

ESTIMATE.

3,357 M Bricks, at \$12.00	.....	\$40,284.00
Labour and Cement, per M \$8.00	.....	26,856.00
82,000 yards Excavation :		
27,333 yards rock, at \$1.50	.....	42,000.00
54,666 " earth, at \$0.20	.....	10,933.00
60,200 " re-filling, at \$0.05	.....	3,010.00
21,800 " carting away, at \$0.25	.....	5,450.00
Inlet Pipes to Sewers :		
3,000 pieces 6 inch, at \$0.33 each	.....	990.00
1,000 " 9 " 0.66 "	.....	660.00
1,000 " 12 " 1.00 "	.....	1,000.00
100 " 15 " 1.90 "	.....	190.00
Laying Pipes from 400 Catch Pits, with cement, each \$2.50	.....	1,000.00
Pipes from 400 Catch Pits, each 25 feet 9 inch., at \$0.33	.....	3,300.00
Excavating 400 Catch Pits, 2½ yards each, at \$0.50	.....	500.00
Excavating for Pipes from Catch Pits, 4,000 yards, at \$0.50	.....	2,000.00
Granite Fittings for 400 Gratings, at \$4.00	.....	1,600.00
100 Man Holes, each \$10.00	.....	1,000.00
Outlet at Collins's Wharf :		
450 yards ballast, at \$1.00	.....	\$450.00
160 " masonry, at \$12.00	.....	1,920.00
150 " concrete, at \$4.00	.....	600.00
Outlet at City Wharf	.....	2,000.00
Outlet at Queen's Wharf	.....	1,000.00
Additional 10 per cent. of above	.....	14,674.00
		<u>\$161,417.00</u>

REDUCED ESTIMATE.

3,357 M Brick, at \$9.00	.....	\$30,213.00
Labour and Cement, at \$7.00	.....	23,499.00
82,000 yards Excavation :		
27,333 yards rock, at \$1.10	.....	30,066.00
54,666 " earth, at \$0.17	.....	9,273.00
Re-filling 60,200 yards, at \$0.05	.....	3,010.00
Carting away 21,800 yards, at \$0.20	.....	4,360.00
Inlet Pipes to Sewers :		
3,000 pieces 6 inch, each at \$0.26	.....	780.00
1,000 " 9 " " 0.50	.....	500.00
1,000 " 12 " " 0.80	.....	800.00
100 " 15 " " 1.60	.....	160.00
Pipes from 400 Catch Pits, each 25 ft. 9 in., at \$0.25	.....	2,500.00
Excavating 400 Catch Pits, each 2½ yards, at \$0.40	.....	400.00
Excavation for Pipe, 4,000 yards, at \$0.40	.....	1,600.00
Granite Fittings for 400 Gratings, at \$4.00	.....	1,600.00
100 Man Holes, each \$10.00	.....	1,000.00
Laying Pipes from 400 Catch Pits, with Cement, at \$1.75	.....	700.00
Outlet at Collins's Wharf :		
450 yards ballast, at \$0.75	.....	\$337.50
160 " masonry, 12.00	.....	1,920.00
150 " concrete, 3.50	.....	525.00
Outlet at City Wharf	.....	2,000.00
Outlet at Queen's Wharf	.....	1,000.00
Additional 10 per cent of above	.....	11,626.00
		<u>\$127,889.00</u>

I apprehend a material reduction in the cost of the sewerage, on account of the sewers now built—I having estimated the full price for excavation and building in all excepting a few places where I had reason to believe that the present sewers would be efficient: in many others there will at least be a saving in the excavation; and in many places the present sewer will no doubt serve, but from not having any plans of them I could do nothing better than to estimate for new sewers.

OUTLET AT CITY WHARF.

This outlet being city property, and a property that will be very much required as a landing wharf, I have placed the cost of extension at \$2,000, without making any estimate of the cost. Merely a protection to the sewer can no doubt be built for this or perhaps a less sum, but I would strongly advise that the whole wharf be built out fifty or sixty feet. The only extra expense would be the retaining wall, and there would be a considerable saving in the carting of the wastage by having a place of deposit so near the heaviest of the workings.

In fact, the increased value of the property would more than pay the expenses of a retaining wall. The city has no better place for landing and storing material for sewer and street service. It is also a good site for a stone crusher driven by a steam engine, which, if made use of, would cause a large annual saving in the street service.

ISLEVILLE AND WEST OF NORTH COMMON.

I have not taken these districts into consideration, one reason for which is, I had not the necessary plans, and they will each form part of a separate system, that can be taken up at any time.

A survey should be made, and a system planned at once, so that any sewers that are built would not be thrown away. The north common and its vicinity form a portion of Freshwater river water shed, and will have to be drained into that outlet, but the policy of perfecting that system with the present sparse population may be doubted; but with Isleville it is different, this locality becoming filled up very fast; and a sum of money should be appropriated for that service.

It has been a leading object with me, in perfecting this system of sewers, to make them self-cleansing, and to have as few outlets as possible. I have now two main outlets, with four others, small, and of minor importance, delivering only a small extent of sewerage, and the number of these may possibly, after investigation, be reduced.

I have the honor to be,

Sir, Yours, &c.

JOHN KELLY.

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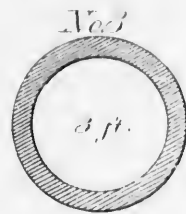
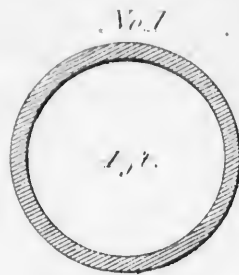
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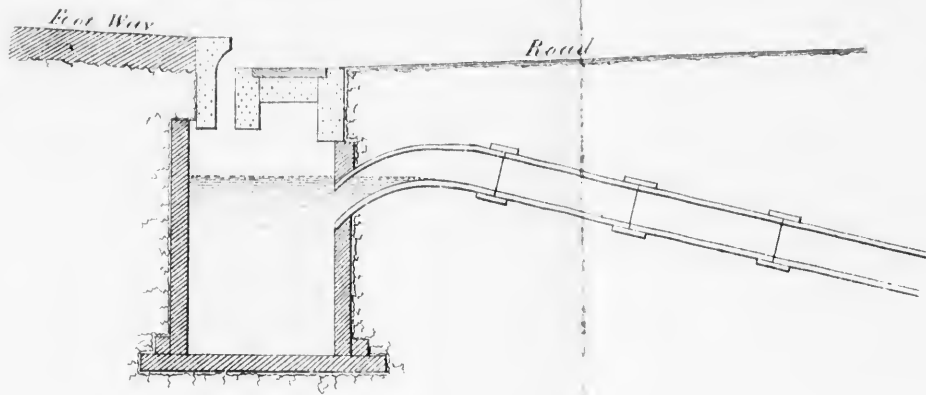
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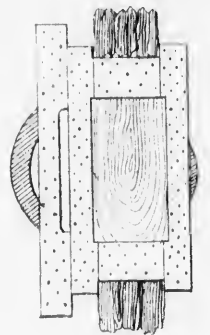
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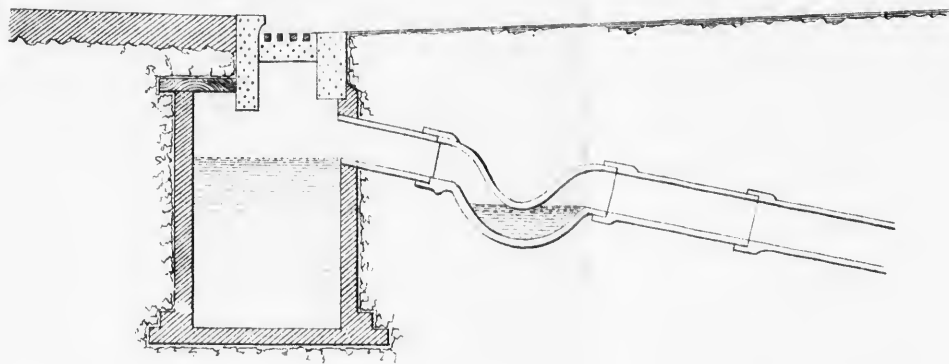
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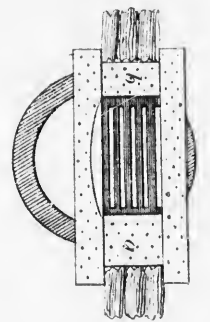
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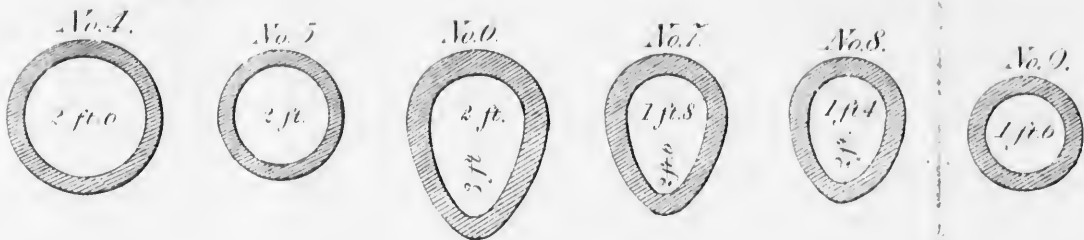
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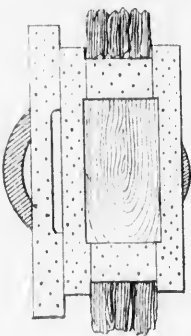
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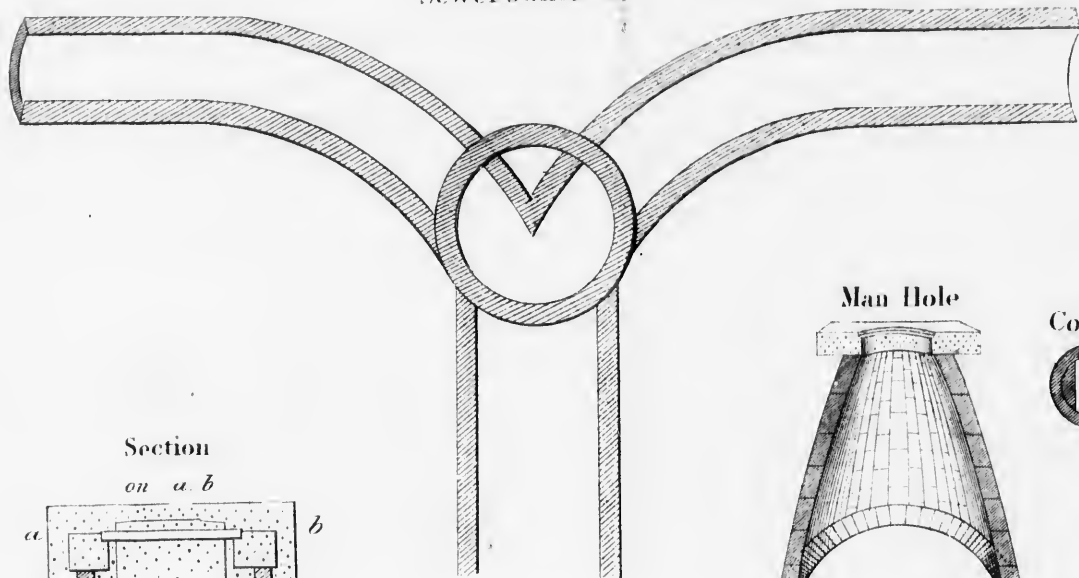
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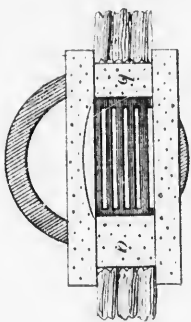
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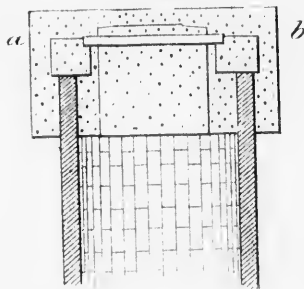
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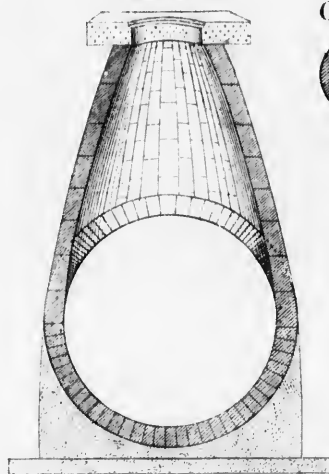
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Man Hole



Cover



Scale $\frac{1}{4}$ Inch to 1 Ft.

