

ANNUAL MESSAGE

— OF THE —

MAYOR

— OF THE —

CITY OF PORTLAND, OREGON,

— TOGETHER WITH —

MUNICIPAL REPORTS

FOR THE FISCAL YEAR ENDING DECEMBER 31,

1883.

ANNUAL MESSAGE

— OF THE —

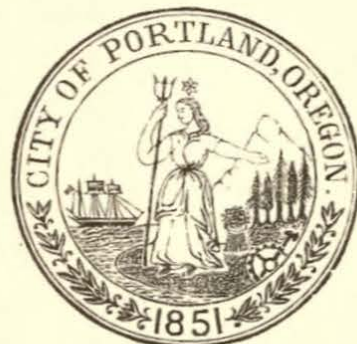
MAYOR

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❖ CITY OF PORTLAND, OREGON, ❖

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MUNICIPAL REPORTS,



FOR THE FISCAL YEAR ENDING DEC. 31, 1883.

— — — — —
PORTLAND, OREGON:

SWOPE & TAYLOR, LEADING PRINTERS, 5 AND 7 WASHINGTON ST.

1883.

CITY OFFICERS-1883-4.

Mayor..... J. A. CHAPMAN.
Auditor and Clerk..... R. B. CURRY.
Treasurer..... D. C. MCKERCHER.
Attorney..... RALPH M. DEMENT.
Police Judge..... S. A. MORELAND.
Chief of Police..... WM. H. WATKINS.
Superintendent of Streets..... A. F. SEARS.
Surveyor..... W. S. CHAPMAN.
Superintendent of City Dredger..... RICHARD HOYT.

ASSISTANTS:

Assistant City Surveyors..... C. E. OLIVER, E. W. PAGETT.
Deputy Superintendent of Streets..... WM. L. BROOKE.
Deputy Auditor and Clerk..... GEO. L. CERRY.
Street Repairer..... P. BEUTGEN.
Keeper of the Park..... JACOB SITTEL.

COMMON COUNCIL.

President of the Council..... W. H. ADAMS.
FIRST WARD.
R. GERDES. J. E. SMITH. J. B. HALEY.
SECOND WARD.
W. H. ANDRUS, W. A. SCOGGIN, W. L. CHITTENDEN.
THIRD WARD.
A. F. SEARS, Jr. W. H. ADAMS. W. B. HONEYMAN.

STANDING COMMITTEES.

Ways and Means SEARS, ANDRUS, GERDES.
Accounts and Current Expenses..... HALEY, SCOGGIN, ADAMS.
Fire and Water..... ANDRUS, SEARS, SMITH.
Streets and Public Property..... SCOGGIN, ADAMS, GERDES.
Landings and Wharves. SMITH, SCOGGIN, ADAMS.
Health and Police..... GERDES, SEARS, ANDRUS.
Judiciary ADAMS, CHITTENDEN, HALEY.
Elections CHITTENDEN, HONEYMAN, SMITH.
Commerce HONEYMAN, CHITTENDEN, HALEY.
Special Committee on Dredger..... GERDES, ANDRUS, SEARS.

HEALTH DEPARTMENT.

BOARD OF HEALTH. { J. A. CHAPMAN, Mayor.
 { W. H. WATKINDS, Chief of Police
 { R. GERDES, Councilman.

POLICE DEPARTMENT.

Police Judge..... S. A. MORELAND.
 Chief of Police..... W. H. WATKINDS.
 Captains of Police, A. F. TURNER, J. T. HAIR, A. M. CORNELIUS.
 Clerk of Police Department..... C. J. CHRISTIE.
 " " " Court..... JOHN A. NEIL.

PORTLAND PAID FIRE DEPARTMENT.

Board of Fire Commissioners. { HENRY ACKERMAN,
 { GEORGE L. STORY,
 { JAMES LOTAN.

President..... HENRY ACKERMAN.
 Secretary..... W. L. EPPINGER.
 Chief Engineer..... THOS. A. JORDAN.
 1st Assistant..... CHAS. C. DOBELBOWER.
 2d Assistant..... JAMES KIERNAN.
 Superintendent Fire Alarm..... JULIUS DILG.

MAYOR'S MESSAGE.

MAYOR'S OFFICE.
 PORTLAND, OR., December 31, A. D., 1883. }

To the Members of the Common Council of the City of Portland:

GENTLEMEN:—The City Charter makes it the duty of the Mayor to present to the Council an annual message embracing a general statement of the condition and affairs of the municipality, recommending such measures as he may deem expedient and proper, and in obedience to said requirement, I herewith present to you such statement, together with my recommendations in reference thereto.

As shown by the reports of the Auditor and Clerk, and, Treasurer, it will be seen that the total receipts of the city for the year ending Dec. 31, 1883, were as follows:

Total receipts.....	\$245,564.84
" Expenditures.....	216,507.10
Receipts over expenditures.....	\$29,057.74

POLICE DEPARTMENT.

The regular police force of the city now numbers thirty-two men, besides the chief and three captains; an increase of seven men. This department under the supervision of the present chief, W. H. Watkins, has since his appointment in July, 1883, attained the gratifying result of being nearly self-sustaining, that is, the receipts in cash have nearly paid all the running expenses of that department, an efficiency at no time attained by any predecessor in this office; notwithstanding the increase in number of officers receiving a salary, and the further difficulty met with in enforcing the collection of fines under certain ordinances recently declared

by the higher courts to be inoperative under the present Charter, and consequent loss to the city of large sums of money.

Aside from this little discrepancy in the Charter, and the apparent emulation between local newspapers in furthering petty political bickerings, the city of Portland has every reason to be proud of the fact of being well protected in life and property; comparing favorably with any other city of like age and size in the world.

And there seems to be no reason for apprehension that this latter desirable result will not continue, as long as the present chief is permitted to occupy his place at the head of the police force.

RECEIPTS AND EXPENSES OF POLICE DEPARTMENT.

July, 1883.....	\$ 1,700.50
August, ".....	4,029.50
Sept. ".....	2,400.65
Oct. ".....	3,095.35
Nov. ".....	1,637.00
Dec. ".....	1,698.95
Total.....	\$14,561.95

EXPENSES FOR SAME PERIOD.

July, 1883.....	\$ 2,642.45
Aug. ".....	2,614.00
Sept. ".....	2,726.97
Oct. " (After increase of force).....	3,220.00
Nov. " (After increase of force).....	3,289.00
Dec. " (After increase of force).....	3,286.00
Total.....	\$17,778.42

The receipts for the whole year ending Dec. 31, 1883. were \$23,215.85, of which amount \$14,561.95 were collected during the last half year (under Chief Watkins' administration), leaving a balance of \$8,653.90 as all the receipts for the first half year during the administration of Chief Lappeus.

In addition to the above, if the amount of fines imposed by the police court on Chinese tan gamblers, had not been

reversed by a higher court for want of authority under the city Charter and ordinances, to make the arrests, the receipts would have been greater than the expenses, more than \$1,000, which sums were returned to the gamblers.

RIVER IMPROVEMENTS.

It seems almost superfluous for me to comment upon the great necessity of keeping the river open to the commerce of the world, from the city of Portland to the sea, it is a matter well understood by the whole people, about which there seems to be no controversy; except, perhaps, as to the means and methods adopted, and to be adopted, to carry out the work of improving the channel of the river.

A large sum of money has been expended by the city in building a dredger, and large amounts have also been expended in efforts to make its workings a success.

From the records of monthly expenditures for repairs, and salaries of working force, etc., it is evident that the present dredger is a very expensive piece of property to the city. But as some of the matters connected with the construction and operation of the dredger are now before a committee of the council, for investigation, strict propriety forbids further comment on that subject for the present: except the further suggestion to the Council, viz.: that as the successful results to be attained in the working of this dredger seem to be somewhat problematical, would it not be well for the Council to investigate other methods that might prove better and cheaper.

FIRE DEPARTMENT.

Since my annual message for the year 1882 the Fire Department has still been under the control of the same board of Commissioners appointed for that purpose.

The Council has been notified by said board of the estimated amount of taxes to be levied to meet the expenses of the current year, and it is not for me, or the Council, to say whether the amount is excessive, or not, as the board alone has full discretion in that matter; but it is only fair to presume that the well known integrity of all the gentlemen

composing the board is a sufficient guarantee that no unjust or exorbitant sum will be required of the tax-payers for that department of the city government.

HEALTH.

No epidemic of a serious nature has visited the city within the last year, and with the sagacity and vigilance of the present Board of Health, it is safe to say that all necessary precautions available will be used in the future to maintain and perpetuate the health of the inhabitants of the city, as heretofore enjoyed.

LANDINGS AND WHARVES.

The present Chief of Police, under my instructions, has made marked improvement in collecting licenses from wharf owners and lessees; largely enhancing the revenues of the city therefrom, which has previously been almost entirely neglected.

ASSESSMENT OF PROPERTY.

Upon this subject I do not see how I can enlarge or diminish, upon my last annual message. The city is still laboring under the great disadvantage of having to adopt the county assessment, made nearly a year in advance of the time when the city levy is made, which leads to many complications in the way of ownership of property, as well as a difference in values; besides any property admitted by inadvertence or otherwise from the county assessment roll, cannot be assessed by the city under the present law; all of which, and kindred perplexities, are attended with losses to the city, and there is no redress except by legislation.

Your attention is earnestly called to the above subject, with the view that a committee of the Council see to it, that the attention of the next legislature be called to the matter, and the difficulty corrected, by providing that the assessment be made by the city independent of the county assessment. It is very evident to any one who will take the trouble to examine and make the comparison, that more than enough can be saved to the city to pay the expenses of an independent assessment.

PUBLIC LEVEE.

I desire to again call your special attention to the property known as the public levee, the legal title of which I assume to be in the City of Portland, the supervision and control of which has by act of the legislature been vested in the City Council.

It may be set down as a conceded fact, that this property in the hands of private individuals could, with a small outlay, be made to bring in a handsome monthly rental, and there is no reason, apparent to my mind, why the City Council cannot devise some mode by which the city may derive a large revenue from this property. At any rate there appears to be no reason why so valuable a piece of property should remain from year to year in a condition worse than a barren waste. It seems very apparent that all legitimate sources of revenue to the city should be utilized at the present time, whenever practicable, in order to lessen the burden of direct taxation upon the people. With these facts and circumstances in view, I would recommend and urge that the Council take some immediate action in the matter.

I would recommend that reasonable notice be given by publication for sealed bids for the lease of the property, for a term of ten years, be given, and that the same be awarded to the highest responsible bidder, under such proper guarantee for the payment of such monthly rental, for said term, as the Council might deem proper to accept, and under such other restrictions and legal obligations as the responsibility of the transaction might require to be imposed.

SEWERS.

In view of the fact that this branch of the city affairs is intrusted principally to the Superintendent of Streets, and as that officer has been engaged for some time in preparing an elaborate system of sewerage, I deem it inadvisable for me to say anything more than refer you to his official report.

STREET IMPROVEMENT.

There has been a large amount of street improvements made in the city during the year 1883, involving a large outlay of money. But little improvement has been made thus far in the quality of material used, or the manner of putting it down. I would, therefore, call your attention to the suggestions made under this head in my annual message of 1882, and urge its careful consideration.

CITY JAIL.

Too much praise cannot be given to the Committee and the Chief of Police having charge of the much needed improvements to the city jail and surroundings for the efficient manner in which they have discharged their duties. It now presents at once, an appearance of health and cleanliness—being more convenient for the officers, as well as humane towards the unfortunate beings who, of necessity of the law, are compelled to be confined within its walls.

STREET CLEANING.

The Committee on Streets and Public Property from the recommendation of a large number of tax-payers, and from a special request from the Board of Trade, of this city, have purchased horses, carts, and tools necessary for the purpose of cleaning the streets, and placed a competent man in charge of this business, and are now cleaning the streets by the day.

I would suggest and recommend the more satisfactory method of letting that work out by contract, to the lowest responsible bidder, after due notice to receive sealed bids for the same, with the proviso in each bid that the successful bidder will purchase all horses, carts, tools and implements now on hand at cost price, from the city, and deduct the amount from the first payment due on contract.

I am fully convinced that such a course would give better satisfaction to the tax-payers, and be a saving to the city. All of which is most respectfully submitted.

J. A. CHAPMAN,
Mayor.

CITY SURVEYOR'S REPORT.

PORTLAND, Or., Jan. 2nd, 1884.

To the Honorable the Mayor and Common Council of the City of Portland :

GENTLEMEN :—I have the honor to submit the following annual report of the City Surveyor for the year ending December 31. 1883, embracing exhibits of the amounts of the various kinds of work done in the improvement and extending of the city during the past twelve months.

The very considerable enlargement of the territory embraced within the city limits, which took place last January in consequence of an act of the recent legislative assembly of the state of Oregon, has considerably increased the work of the City Surveyor and made it more difficult of accomplishment on account of the greater distance between the different localities of such operations. While the past year has been a comparatively prosperous one for the city, the street work has kept pace with other improvements and the total number of street estimates made during the year only falls one short of the number made during the year previous ; but, as will be seen by the tabular statement hereinafter following, the cost of work is considerably less than it was in 1882, which is attributable to the fact that much of the work done this year was of a less expensive character than usual and several of the more expensive improvements for which contracts have been awarded are yet unfinished and consequently they are not included in this report.

STREET EXTENSIONS.

Thirty surveys have been made by order of your honorable body for the purpose of widening or extending streets

in different portions of the city; the location and extent of such surveys are more particularly set forth in the following:

EXHIBIT OF STREET EXTENSION SURVEYS.

No.	NAMES OF STREETS.	WHEN SURVEYED.	LIMIT OF EXTENSION.	Sq. Ft. AREA.
1	Madison	Jan. 10	Tenth to Twelfth	24049
2	F	Feb. 20	Western Ter. to Co. Road	33900
3	N. Twenty-First	March 1	E to L	90780
4	G	" 17	Western Ter. to a point 1,560 feet westerly	30297
5	H	" 17	Western Ter. to a point 1,560 feet westerly	26475
6	I	" 17	Western Ter. to a point 1,560 feet westerly	94470
7	E	" 17	Western Ter. to a point 1,040 feet westerly	6738 62400
8	N. Twenty-third	" 20	J to F	70119
9	N. Twenty-Second	" 20	J to E	115661
10	Hood	April 3	Hall to Grover	52452
11	N. Seventh	" 17	A to N Front	
12	E	" 17	1040 feet west of Twen- tieth to Co. Road	21075 8277 13896
13	Seventh	" 17	A to B	
14	N. Third	" 28	Ash to H	
15	D	May 2	N. Twentieth to N. Twen- ty-first	27600 51243 27440
16	N. Seventh	" 15	B to N. Front	
17	N. Twenty-Second	" 26	E to B	7801
18	Seventh	" 26	Oak to B	31620
19	N. Fourth	June 4	A to I	
20	D	" 4	Nineteenth to 1,560 feet westerly	82800 13896 87180
21	N. Third	" 23	Ash to H	
22	N. Twenty-first	July 5	E to L	21075
23	E	" 5	Western Ter. to Co. Road	6600
24	N. Twentieth	" 9	W to Y	46980
25	B	" 18	Western Ter. to City Park	50972
26	N. Seventh	August 24	A to N. Front	6700
27	N. Front	Sept. 3	N. Front in Sherlock Add	
28	Thirteenth		Lownsdale Claim line to Columbia	67900 7852 302901
29	N Sixteenth	Nov. 30	Watson's Add. to N Front	
30	T	Dec. 10	N Eighteenth to Co. Road	
Total				1,491,149

From the above it will be seen that the surveys for street extensions have included nearly Thirty-six acres of land to be appropriated to public use. Last year the number of street extension surveys was only fifteen, and the area of land to be appropriated was less than one tenth of the amount above named.

Estimates have been made during the year for the improvement of forty-eight (48) streets, most of which improvements have been completed and accepted by the city, while the balance are well under way.

All work for which contracts were awarded during 1882, and remaining unfinished at the end of that year, has been completed during the past season, and accepted by the city.

One hundred and sixty-eight permits for the improvement of streets by private parties have been issued by the Superintendent of Streets, and filed in this office during the past year, under which a large amount of street work has been done.

UNFINISHED WORK OF 1883.

There still remains work unfinished on several streets, estimates of which have been made and contracts awarded during the past year, the estimated cost of which will be found in the tabular statement hereunto attached.

Accompanying and forming a part of this report are tables more particularly setting forth the streets on which estimates have been made and the amounts of the different kinds of work to be done in improving the same; also, the amounts of street work done under the ordinances, permits and otherwise during the past year.

IMPORTANT SURVEYS

Were made early in the last year by my predecessor, Mr. D. W. Taylor, and by order of your honorable body. Among these were surveys of the new city boundaries and the lines of the public park in the western part of the city; and I would earnestly recommend that the results of these surveys

be perpetuated by setting substantial stone monuments in place of the posts set to mark the location of those important lines and corners. The new city limits also include all or portions of many donation land claims, the location of the corners of which are now well known and undisputed; and as the expense of marking these corners by stone monuments would be inconsiderable, I take the liberty of saying that a few dollars spent for such purposes at the present time might save a repetition of the expensive litigation which resulted from the uncertainty as to the exact location of the south line of the John H. Couch donation land claim and the north line of the Finice Caruthers' donation land claim. As a further unfortunate result of the dispute as to the location of the above lines, several brick buildings now encroach upon A street and the streets in many parts of the additions to Caruthers' addition to the city of Portland vary as much as from ten to thirty feet from the lines of the streets in (the original) Caruthers' addition to the City of Portland. The simple and effective manner of preventing the re-occurrence of such expensive and disastrous disputes, is for the city to cause a substantial stone monument to be set at every section and quarter section corner, and at every corner of a donation land claim within the city limits.

I have nearly completed a survey of the city park and taken levels on the same, preparatory to making a contour map, from which a plan for improving and beautifying the park may be made. This survey will be completed during the current month.

By your order I am compiling a new map of the city, and as the corporate limits were extended by the last legislature so as to include a large amount of new territory, of which no official survey has been made by the city; it will require a large amount of field work to ascertain the location and boundaries of the numerous tracts of land included in the limits of such extension.

With a hearty appreciation of the kindly consideration

which I have received from all members of your honorable body, especially Messrs. Scoggin, Adams and Gerdes, constituting the committee on streets and public property—I have the honor to remain, your obedient servant,

W. S. CHAPMAN,
City Surveyor.

WORK DONE IN 1883

Name of Street.	Extent of Improvement.	Date of Estimate.	No. of Ordinance.	Cubic Yards Excavation.	Cubic Yards Embankment.	Lineal Feet.			
						App. New.	Box Culvert.	Sidewalk.	
								New.	Relay.
1. Front	Ash to Vine	Jan'y 4, 1883	3670	121				349	
2. Front	Vine to Harrison	19, 1883	3583	32				457	
3. E	Front to Third	30, 1883	3686	113	355			1272	
4. Tenth	Mongom'y to College	Mar. 24, 1883	3676	1019	1893			364	
5. Washington.	Twelfth to B		3682		4817			1537	
6. H	N 7th to N 20th	27, 1883	3723	944	6595			50	
7. N Ninth	G to J	27, 1883	3731	336	63			400	
8. Thirteenth	Morrison to Yamhill	April 10, 1883	3751	1777	2			635	
9. Fifth	Columbia to Jackson	13, 1883	3736	1455	268				
10. Eighth	Salmon to Stark	13, 1883	3752	487	421				
11. Columbia	Front to Third	13, 1883	3762	172				1485	
12. Clay	Front to Twelfth	30, 1883	3765	191	114			106	
13. Fifth	Jackson to Lincoln	30, 1883	3768	106	45			4199	
14. I	N Ninth to N 20th	May 10, 1883	3767	2139	4447			36	
15. Seventh	Madison to Market	10, 1883	3787	486	286			144	
16. Meade	S 1st to Macadam R'd	12, 1883	3766	11481	915			2046	
17. L	N Ninth to N 13th	29, 1883	3799	1158	1719			1548	
18. Jefferson	Front to Seventh	June 1, 1883	3797	961	6			285	
19. Front	Madison to Clay	1, 1883	3800	46					
20. Columbia	Front to Second	13, 1883							
21. Ninth	Washington to Market	19, 1883	3826/3827	996	2044			3683	
22. N Fifteenth	B to S	July 14, 1883	3710	2193	102			12	100
23. Fourth & N Fo'th	Pine to G	14, 1883	3780	89	450			848	100
24. N Twentieth	F to J	16, 1883	3814		167				
25. Mill	Front to East Park	25, 1883	3880	811	243				
26. S	N 22d to N 13th	Aug. 31, 1883	3879		45	72		372	300
27. Eleventh	B to Montgomery	Sept. 15, 1883	3930	1613	816			2096	
28. Lincoln	Front to W Bound'ry	21, 1883	3942	1471	653			3204	
29. M	N 10th to N 19th	Oct. 4, 1883	3919	4434	1113				34
30. Intersections of	Wash'n. B. N 14th } & Lownsdale. }	6, 1883	3960		136				
31. Hall	Front to Ninth	11, 1883	3918	144	243			1687	
32. N	N 11th to N 19th	12, 1883	3921	1754	884			1293	
33. Ash	Third to Fourth	17, 1883	3953	95	198			12	160
34. Ninth	Stark to Washington	18, 1883	3966	83	98			300	
35. Yamhill	Front to First	31, 1883	3986	87					
36. Water St. Road'y	Columbia to Jeffer'n	Dec. 7, 1883	4032	996	46			36	
37. B	Extension								
Grand Total				37,790	29,484	2	72	2822	700

UNDER ESTIMATES OF 1883.

Lineal Feet.		Lineal feet New Curb.	Lineal feet Cov'g Plank and Stringers.	Lineal feet Plank Roadway.	Lineal feet Bridge.	Lineal feet Brick Culvert.	Lineal feet Stone Crosswalk.	Sq. Yards Stone Pavement.	Cubic Yards Macadam.		
Crosswalk.										Gutter.	
New.	Relay.									Box.	Open.
		70						844.5	1.5		
283			50					2262.0	680.8		
360			108		364						
144	144		36								
					90				653.2		
338	694			39							
208	136			100					2838.8		
280	36								1552.7		
316			150						310.7		
			36								
432	50		50						409.9		
36	307		100								
654									1276.1		
144											
262	18								1512.5		
360	18								592.6		
									7.0		
788	344		50						3549.8		
479	1253		432						3642.3		
597									2239.5		
66	426										
			522	6088					1797.5		
374	1184		182						4286.3		
			50								
492			252								
36											
398											
284											
			36								
					1205						
									208.3		
									277.6		
			36						777.0		
					240						
							25				
7607	4752	2456	6088	130	364	1535	25	3883.5	25,837.4		

WORK DONE IN 1888 UNDER PERMITS.

Permits issued	Cubic yards Excavation.	Cubic yards Embankment.	Lineal feet Sidewalk.	Lineal feet Crosswalk.	Lineal feet Plank Roadway.	Lineal feet Open Gutter.	Lineal feet Box Gutter.	Lineal feet Curb.	Lineal feet Stone Sidewalk.	Cubic yards Macadam.	Square yards Stone Block Pavement.
173	24866	23886	23657	1552	670		18			1040	2478
	24866	23886	23557	1552	570		18			1040	2478

UNFINISHED WORK OF 1888.

NAME OF STREET.	Extent of Improvement.	Date of Estimate.	No. of Ordinance.	Cubic yards Excavation.	Cubic yards Embankment.	Lineal feet Sidewalk.		Lineal feet Crosswalk.		Lineal feet Gutter.		Lineal feet New Curb.	Lineal feet Covering Plank and Stringers.	Lineal feet Plank Roadway.	Lineal feet Bridge.	Cubic yards Macadam.
						New.	Relay.	New.	Relay.	Box.	Open.					
Pine	Third to Fourth	Oct.	16, 1883	3952	21	28		200								167.7
C	N 3d to N 4th		16, 1883	3958	29	98		300								260.2
Front and S Front.	Harrison to Porter	Nov.	8, 1883	3996	7157	706	1524		866	486.0	496					2490.4
D	N 14th to N 18th	Dec.	7, 1883	4028	13	44		261							138	1322
C	N 14th to N 18th		7, 1883	4030	419	200		736								607.2
First	Salmon to Harris'n		10, 1883	3997	113				440	376.0	72					117.9
Stark.	In sec. 9th & N 10th		21, 1883	4071	10				36	128.5						
Grand Total				7862	1076	2521	500	1810	990.5	568				138	1322	3648.4

WORK DONE IN 1888 UNDER ESTIMATES OF 1882.

NAME OF STREET.	Extent of Improvement.	Date of Estimate.	No. of Ordinance.	Cubic Yards Excavation.	Cubic Yards Embankment.	Lineal feet Sidewalk.		Lineal feet Crosswalk.		Lineal feet Gutter.		Lineal feet New Curb.	Lineal feet Covering Plank and Stringers.	Lineal feet Plank Roadway.	Lineal feet Bridge.	Cubic yards Macadam.
						New	Rel'y	New	Rel'y	Box.	Open					
S	N Front to N 22nd	May	31, 1882	3448	4080	1523	2904		432							
N Nineteenth	B to S	June	10, 1882	3452					144							1726.8
B	N Third to City Boundary.	August	8, 1882	3453		5000	990		36	1260	324					2792.0
J	N Ninth to City Boundary.	August	8, 1882	3459	2048	23										
G	N Front to City Boundary.	August	25, 1882	3432	2071		450									
Eighth	Stark to Harrison	Oct.	5, 1882	3587	86	4	1049									
N Thirteenth	R to S	Oct.	16, 1882	3580	80	628	339				36				680	
N Thirteenth	B to G	Oct.	24, 1882	3586	104	946	838				100					
Mill	Front to Tenth	Nov.	17, 1882	3611	357	71	2226		280							
N Twentieth	B to I	Nov.	21, 1882	3631	13	264	100				108	400				777.8
E	N 19th to N 21st	Nov.	29, 1882	3632	28	37			222			100				
West Park	Salmon to Stark	Dec.	29, 1882		422	72	624									
Grand Total				9289	8568	9517	1176	1260	568	460	100				680	5296.6

Permits Issued.	Cubic yards Excavation.		Cubic yards Embankment.		Lineal feet Sidewalk.		New, Relay.		Lineal feet Crosswalk.		Lineal feet Gutter.		Lineal feet Curb.		Lineal feet Covering Plank and Stringers.		Lineal feet Plank Roadway.		Lineal feet Bridge.		Lineal feet Stone Crosswalks.		Lineal feet Apron.		Lineal feet Box Culvert.		Lineal feet Brick Culvert.		Cubic Yards Macadam.		Square Yards Stone Block Pavement.		
Total	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	24866	28883	
Cost of work done during 1883 under permits, \$42,446.60.																																	
WORK DONE IN 1883 UNDER ESTIMATES OF 1882.																																	
Total	9286	8568	9517	1156	1360	568	400	100	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	
WORK DONE IN 1883 UNDER ESTIMATES OF 1883.																																	
Total	37799	29484	28220	703	7607	4752	2456	6088	139	364	1535	394	1535	2	72	25	25897.4	1040.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	
RECAPITULATION.																																	
Permits	24866	28883	23557	1552	1176	1360	508	400	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	
Est. of '82	9286	8568	9517	1156	1360	568	400	100	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	
Est. of '83	37799	29484	28220	703	7607	4752	2456	6088	139	364	1535	394	1535	2	72	25	25897.4	1040.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	2478.0	
Not Class.	75000	100000	10000	2000	2000	4752	500	1000	20000	10000	1000	1500	1500	2	72	25	25897.4	12858.1	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0		
G.D Total	16845	161935	71234	703	12335	6012	3524	7548	2278	20400	11034	3033	1500	2	72	25	25897.4	12858.1	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0	13000.0		

Cost of work not classified, \$97,450.00.

COMPARATIVE TABLE—Ten Years' Work.

1874.	\$ 26,558.20	1879.	\$140,881.64
1875.	29,992.44	1880.	241,022.52
1876.	33,825.17	1881.	285,571.97
1877.	42,109.78	1882.	364,044.90
1878.	119,811.91	1883.	296,768.00

ANNUAL REPORT

OF R. B. CURRY, AUDITOR AND CLERK OF THE CITY OF PORTLAND, FOR THE YEAR ENDING DECEMBER 31, 1883.

To the Honorable the Common Council of the City of Portland:

GENTLEMEN:—I submit herewith my annual report for the fiscal year ending December 31, 1883, showing the expenditures for the year, and the financial condition of the city, as follows, to-wit:

GENERAL FUND.

Balance in Treasury Jan. 1, 1883	\$ 8,475 67
Temporary loan	27,000 00
Delinquent tax 1874	51 45
Sale of stray animal	12 75
Sale of grass in Park blocks	24 50
Rent of Park building	25 00
Tax roll of 1883	15,874 34
“ “ (delinquent)	2,275 60
Transfer from various funds	1,350 77
Delinquent tax 1863	3 53
Premium on sale of bonds	425 00
Business licenses	62,272 39
Dog licenses	1,126 65
	\$ 118,917 65

Contra.

Transfer to Lamp Fund	2,000 00
do Willamette river fund	18,000 00
do Fire Department fund	10,000 00
do 14th St bridge fund	3,000 00
do N 14th street fund	555 76
do D street fund	1,479 42
do B street sewer fund	46 76
do S street fund	5 64
do E Park street fund	87
do Park fund	1,000 00

Transfer to N 23rd St. Ext. fund	70 00	
do F St. extension fund.	419 00	
do Mill St. Ext. fund.	355 00	
do Sixth St. fund.	217 00	
do Salmon St. fund	19 18	
do B St. fund.	461 30	
do N 20th St. Ext. fund.	163 50	
do N 21st St. Ext. fund.	599 31	
do N 22nd St. Ext. fund	180 00	
do Jefferson St. Ext. fund	1,163 00	
do Hood St. Ext. fund.	1,426 00	
do Washington St. fund	216 88	
do D St. fund	8 00	
Interest accrued on bonds sold before delivery.	188 90	
Warrants paid and returned.	66,671 68	
Balance in Treasury Dec. 31, 1883	10,670 45	\$ 118,917 65

AUDITED CLAIMS PAID BY WARRANTS.

SALARIES.	
Mayor and Members of the Council	\$ 3,954 10
Auditor and Clerk	2,400 00
City Surveyor	2,400 00
City Attorney	2,000 00
Superintendent of Streets	1,875 79
Police Judge	1,800 00
City Treasurer	1,200 00
Street Repairer	1,170 00
Deputy Supt. of Streets	1,170 00
“ “ “ (clerk and draughtsman)	521 40
Assistant City Surveyor	1,072 50
	\$ 19,563 79

STREETS AND PUBLIC GROUNDS.

Improvement of streets in front of public property	1,083 40
Repairs to streets and bridges	2,819 27
Sewers and nuisances	889 72
Surveyor's Assistants	3,063 04
Pay of street viewers	512 50
Care of city horse	286 50
Street monuments	54 00
Fourteenth street bridge	125 00
Tanner's creek	30 00

Care of public grounds	60 58	
Cleaning streets	248 00	
Cleaning street crossings	1,391 60	
Street signs	135 00	
		\$ 10,698 61

COUNCIL ROOMS AND OFFICES.

Rent of Council rooms, offices, etc.	3,189 21	
Stationery and printing	1,347 34	
		\$ 4,536 55

HEALTH AND POLICE.

Expenses of Police building	2,313 81	
Board of Prisoners	1,966 30	
Killing and burying dogs	184 00	
Medical attendance	155 68	
Infectious diseases	2,353 32	
		\$ 6,973 11

MISCELLANEOUS.

Advertising	642 40
Litigation	273 02
Clerk hire	1,374 35
Copying assessment roll	118 00
Printing city charter	63 00
Relief of H. M. Taylor	149 89
do Joseph Hellering	69 30
do S. O. Hersey	10 80
do Holman & Lamberson	39 60
do I. W. Buchanan	10 80
do L. Eppinger	25 00
do L. C. Henrichsen	18 00
do Gerdes & Lutz	25 00
do Thos. Guinean	75 00
do L. B. Berlin	75 00
do Jno. Moir	21 15
do D. P. Thompson	162 00
do Henry Weinhard	11 52
do R. R. Thompson	32 03
do A. Thompson	17 78
do Jacob Keil	14 24
do Geo. P. Lent	9 00
do A. B. Singleton	200 00
do Alfred Nelson	100 00
do S. A. Moreland	20 00
do Wm. Washer	47 00

Relief of T. D. Rumble.....	22 20	
B. S. Reilly, improving N 20th St..	130 00	
A. G. Walling, lithographing bonds	35 00	
Pay of stenographers.....	154 50	
Purchase of instruments for Surveyor's office.....	404 25	
Purchase of property (delinquent str. assessments).....	10,613 51	
Temporary loan and interest.....	11,050 00	
Expenses of the pound.....	60 00	
Elections.....	44 15	
Codifying ordinances.....	40 00	
Miscellaneous.....	3 00	
		\$ 26,160 49
Warrants outstanding Jan. 1, 1883.		131 70
		\$ 68,063 72
Warrants paid and returned.....	\$ 66,671 68	
Warrants outstanding Dec. 31, 1883	1,392 04	
		\$ 68,063 72

FIRE DEPARTMENT FUND (OLD).

Balance Jan. 1, 1883.....	5 58	
To temporary loan.....	13,000 00	
		\$ 13,005 58

Contra.

By warrants paid and returned.....	5,969 09	
By balance transferred to new fund.	7,036 49	
		\$ 13,005 58

AUDITED CLAIMS PAID BY WARRANTS.

Horse hire.....	33 25	
Salary of electrician.....	50 00	
Salary of Secretary of department..	50 00	
Engine drivers.....	180 00	
Repairs and supplies.....	172 30	
Constructing cisterns.....	425 00	
Warrants outstanding Jan. 1, 1883.	5,058 54	
		\$ 5,969 09
Warrants paid and returned.....		\$ 5,969 09

FIRE DEPARTMENT FUND (NEW).

Sale of hook and ladder truck.....	450 00	
do No. 5's old bell.....	96 00	
do hose.....	100 00	

Sale of old hose.....	100 00	
do old copper.....	64 50	
do old iron.....	30 00	
do tender cart.....	50 00	
do exempt certificates.....	126 00	
do hose cart.....	75 00	
do hose cart and two tenders..	165 00	
Tax roll of 1883.....	34,600 56	
Old department fund balance.....	7,036 49	
Transfer from general fund.....	10,000 00	
Transfer from police fund.....	1,000 00	
Temporary loan.....	3,500 00	
		\$ 57,485 05

Contra.

Warrants paid and returned.....	\$ 57,318 16	
Balance in treasury Dec. 31, 1883..	166 89	
		\$ 57,485 05

WARRANTS DRAWN.

General expenses.....	\$ 54,999 73	
Water supply, hydrants and cisterns	2,575 00	
		\$ 57,574 73
Warrants paid and returned.....	\$ 57,318 16	
Warrants outstanding Dec. 31, 1883	256 57	
		\$ 57,574 73

POLICE FUND.

Balance in Treasury Jan. 1, 1883...\$	5,809 36	
Tax roll of 1883.....	23,323 14	
Fines in state cases.....	1,785 00	
Fines in city cases.....	20,896 45	
Costs in city cases.....	65 80	
Costs in state cases.....	468 60	
Fees, J. H. Lappeus, ex-chief police	1,131 70	
		\$ 53,480 05

Contra.

By transfer to lamp fund.....	\$ 3,000 00	
By transfer to fire department fund	11,000 00	
Warrants paid and returned.....	35,192 62	
Balance in Treasury Dec. 31, 1883	4,287 43	
		\$ 53,480 05

WARRANTS DRAWN.

Pay of police.....	\$ 34,132 62	
Pay of specials.....	453 00	
Clerk hire.....	396 30	
Witnesses and jurors.....	416 60	
		\$ 35,398 52

Warrants outstanding Jan 1, 1883.. 153 40

Warrants paid and returned.....	\$ 35,192 62	
Warrants outstanding Dec. 31, 1883	359 30	
		\$ 35,551 92

WILLAMETTE RIVER FUND.

Balance in Treasury Jan. 1, 1883..	\$ 12 86	
Temporary loan.....	15,000 00	
Transferred from general fund.....	3,000 00	
Capt. Powell, (am't ret'd).....	62 34	
Tax roll of 1883.....	21,292 65	
Transfer from lamp fund.....	3,000 00	
		\$ 42,367 85

Contra.

Warrants paid and returned.....	\$ 40,916 86	
Balance in Treasury Dec. 31, 1883..	1,450 99	
		\$ 42,367 85

WARRANTS DRAWN.

Dredger machinery.....	\$ 2,000 00	
Equipping dredger scows.....	558 70	
Salary of superintendent.....	1,988 84	
General expense.....	18,659 51	
Jno. Honeyman & Co.....	455 96	
Repairs and supplies.....	751 56	
Towage.....	15 00	
Insurance.....	1,212 00	
Fuel.....	369 50	
		\$ 26,011 07

Warrants outstanding Jan. 1, 1883.. 14,909 79

Warrants paid and returned.....	\$ 40,916 86	
Warrants outstanding.....	4 00	
		\$ 40,920 86

LAMP FUND.

Balance Jan. 1, 1883.....	\$ 423 15	
Transferred from general fund....	2 000 00	
Transferred from police fund.....	3,000 00	
Tax roll of 1883.....	17,492 36	
Sale of old lamp post.....	9 60	
		\$ 22,925 11

Contra.

Transferred to Wil. river fund....	\$ 3,000 00	
Warrants paid and returned.....	17,602 82	
Balance in Treasury Dec. 31, 1883..	2,322 29	
		\$ 22,925 11

WARRANTS DRAWN.

Lighting gas lamps.....	\$ 9,236 65	
Lighting oil lamps.....	6,116 20	
Erecting and repairing.....	2,179 97	
		\$ 17,532 82
Warrants outstanding Jan. 1, 1883..		<u>70 00</u>

Warrants paid and returned..... \$ 17,602 82

SURPLUS FUND.

Balance Jan. 1, 1883.....	\$ 152 17	
Balance Dec. 31, 1883.....	152 17	

RAILROAD FUND.

Balance Jan. 1, 1883.....	\$ 59 12	
Balance Dec. 31, 1883.....	59 12	

INTEREST FUND.

Tax roll of 1883.....	\$ 6,500 00	
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Contra.

Coupons paid and returned.....	\$ 4,990 00	
Balance in Treasury Dec. 31, 1883..	1,510 00	
		\$ 6,500 00

BOND FUND.

Sale of bonds, \$20,000 00 6% 10 yrs. @ 102 $\frac{1}{2}$	\$ 20,425 00	
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Contra.

Outstanding bonds taken up.....	\$ 20,000 00	
Premium transferred to general fund.....	425 00	
		\$ 20,425 00

PARK FUND.

Balance in Treasury Jan. 1, 1883..	\$ 320 80	
Transferred from general fund.	1,000 00	
		\$ 1,320 80

Contra.

Warrants paid and returned	\$ 720 24	
Balance in Treasury Dec. 31, 1883..	600 56	
		\$ 1,320 80

WARRANTS DRAWN.

Labor in city park.....	\$ 470 24	
Salary of the keeper of the park...	300 00	
		\$ 770 24
Warrants paid and returned.....	\$ 720 24	
Warrants outstanding Dec. 31, 1883	50 00	
		\$ 770 24

STREET IMPROVEMENT FUND.

Balance in Treasury Jan. 1, 1883..	\$ 13 941 21	
Collections	193,107 38	
Transfers from general fund	2,964 05	
		\$ 210,012 64

Contra.

Warrants paid and returned	\$ 202,756 93	
Transfers	1,244 64	
Balance in Treasury Dec. 31, 1883..	6,011 07	
		\$ 210,012 64

STREET EXTENSION FUND.

Balance in Treasury Jan. 1, 1883..	\$ 4,299 00	
Collections.....	58,207 44	
Transfers from general fund.....	4,375 81	
		\$ 66,882 25

Contra.

Warrants paid and returned.....	\$ 61,974 75	
Transfers	5 00	
Balance in Treasury Dec. 31, 1883 ..	4,902 50	
		\$ 66,882 25

STREET SEWER FUND.

Balance in Treasury Jan. 1, 1883..	\$ 5,029 94	
Collections.....	4,273 80	
Transfers from general fund.....	46 76	
		\$ 9,350 50

Contra.

Warrants paid and returned	\$ 7,083 94	
Transfers	101 13	
Balance in Treasury Dec. 31, 1883..	2,165 43	
		\$ 9,350 50

SUMMARY OF RECEIPTS.

General fund	\$110,441 98	
Fire department fund—old.....	13,000 00	
Fire department fund—new.....	57,485 05	
Police fund.....	47,670 69	
Lamp fund.....	22,501 96	
Interest fund	6,500 00	
Bond fund	20,000 00	
Park fund.....	1,000 00	
Street improvement fund	196,071 43	
Street extension fund.....	62,583 25	
Street sewer fund.....	4,320 56	
Willamette river fund	42,354 99	
		\$583,929 91
In Treasury Jan. 1, 1883.....		38,528 86
		\$622 458 77
Total receipts for the year 1883	\$583,718 61	
Total receipts for the year 1882.....	380,960 26	
		\$202,758 35
Increase of receipts over previous year.....		\$202,758 35

SUMMARY OF EXPENDITURES.

General fund.....	\$108,247 20	
Fire department fund—old.....	13,005 58	
Fire department fund—new.....	57,318 16	
Police fund	49,192 62	
Willamette river fund	40,916 86	
Lamp fund.....	20,602 82	
Interest fund	4,990 00	
Bond fund.....	20,000 00	
Park fund.....	720 24	
Street improvement fund.....	204,001 57	

Street extension fund.....	61,979 75	
Street sewer fund.....	7,185 07	
		\$588,159 87
In Treasury Dec. 31, 1883.....		34,298 90
		<u>\$622,458 77</u>

Total expenditures for the year 1883	\$588,159 87
Total expenditures for the year 1882	376,138 67
Increased expenditures over previous year.....	\$212,021 20
Increased expenditures over receipts of previous year.....	9,262 85

SUMMARY OF BALANCES.

General fund.....	\$ 10,670 45
Fire department fund.....	166 89
Police fund.....	4,287 43
Willamette river fund.....	1,450 99
Lamp fund.....	2,322 29
Interest fund.....	1,510 00
Park fund.....	600 56
Railroad fund.....	59 12
Surplus fund.....	152 17
Street improvement fund.....	6,011 07
Street extension fund.....	4,902 50
Street sewer fund.....	2,165 43
In Treasury Dec. 31, 1883.....	\$ 34,298 90

SUMMARY OF INDEBTEDNESS.

Bonds due May 1, 1891.....	\$ 56,500 00
Bonds due June 1, 1893.....	20,000 00
Bills payable.....	23,500 00
Warrants outstanding Dec. 31, 1883	\$100,000 00
	2,061 91
	<u>\$102,061 91</u>
Funds in Treasury available for payment of above.....	\$ 18,898 05

RECAPITULATION.

ACTUAL EXPENDITURES FOR THE YEAR 1883.

General fund.....	\$ 73,319 17
Fire department fund.....	58,485 28
Police fund.....	35,398 52
Willamette river fund.....	26,011 07

Lamp fund.....	17,532 82
Interest fund.....	4,990 00
Park fund.....	770 24
	<u>\$216,507 10</u>

RECEIPTS FOR THE YEAR 1883.

General fund.....	\$ 65,103 14
Fire department fund.....	1,256 50
Police fund.....	24,347 55
Loan.....	33,500 00
Tax roll of 1883.....	121,357 65
Receipts over expenditures...	\$245,564 84
	\$ 29,057 74

Very respectfully,

R. B. CURRY,

Auditor and Clerk

of the City of Portland.

TREASURER'S QUARTERLY REPORT.

QUARTERLY EXHIBIT OF D. C. McKERCHER, TREASURER
OF THE CITY OF PORTLAND, FOR THE QUARTER
ENDING DECEMBER 31, 1883.

GENERAL FUND.

Balance Sept. 30.....	\$19,078 98	
Received for taxes.....	503 35	
Business licenses.....	22,704 00	
Dog licenses.....	445 50	
	<u>\$42,731 83</u>	
Transfer to various streets.....	4,217 99	
Warrants paid and returned.....	27,843 39	
	<u>\$32,061 38</u>	

Balance.....\$10,670 45

POLICE DEPARTMENT.

Balance Sept. 30.....	\$12,871 30	
Receipts from Judge Moreland.....	15,268 45	
	<u>\$28,139 75</u>	
Transferred to Fire Department.....	\$11,000 00	
Warrants paid and returned.....	12,852 32	
	<u>\$23,852 32</u>	

Balance.....\$ 4,287 43

FIRE DEPARTMENT.

Balance Sept. 30.....	\$ 25 66	
Transfer from Police Department.....	11,000 00	
Sale of horses.....	91 50	
Loan from First Nat. Bank.....	3,500 00	
	<u>\$14,617 16</u>	
Warrants paid and returned.....	14,450 27	

Balance.....\$ 166 89

LAMP FUND.

Balance Sept. 30.....	\$11,665 87	
Sale broken lamp.....	9 60	
	<u>\$11,675 47</u>	
Warrants paid and returned.....	6,353 18	
Transferred to Willamette river fund.....	3,000 00	
	<u>\$ 9,353 18</u>	

Balance.....\$ 2,322 29

INTEREST FUND.

Balance Sept. 30.....	\$ 3,805 00	
Coupons paid.....	2,295 00	
	<u>\$ 1,510 00</u>	

PARK FUND.

Balance Sept. 30.....	\$ 862 51	
Warrants paid and returned.....	261 95	

Balance.....\$ 600 56

WILLAMETTE RIVER FUND.

Balance Sept. 30.....	\$ 6,285 05	
Transfer from lamp fund.....	3,000 00	
	<u>\$ 9,285 05</u>	
Warrants paid and returned.....	7,834 06	

Balance.....\$ 1,450 99

SURPLUS FUND.

Balance Sept. 30.....	\$ 152 17	
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RAILROAD FUND.

Balance Sept. 30.....	\$ 59 12	
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STREET EXTENSION FUND.

Balance Sept. 30.....	\$ 4,631 00	
Collections.....	35,637 69	
Transfers.....	3,531 81	
	<u>\$43,800 50</u>	
Warrants paid and returned.....	38,898 00	

Balance.....\$ 4,902 50

STREET SEWER FUND.

Balance Sept. 30.....	\$ 2,165 43	
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STREET IMPROVEMENT FUND.

Balance Sept. 30.....	\$17,634 10	
Collections.....	42,832 80	
Transfers.....	686 18	
	<u>\$61,153 08</u>	
Warrants paid and returned.....	55,142 01	

Balance.....\$ 6,011 07

Balance in treasury.....\$34,298 90

Respectfully submitted,

D. C. McKERCHER,
City Treasurer.

REPORT

—UPON A—

SYSTEM OF SEWERAGE FOR THE CITY OF PORTLAND, OREGON,

To the Mayor and Common Council, December, 1883.

By ALFRED F. SEARS, C. E.,

M. Am. Soc. C. E.; M. National Corps of Engineers, of Peru,
S. A.; Superintendent of Streets of Portland.

"The great purpose of modern water sewerage is, to remove immediately, entirely beyond the occupied portions of a town, all manner of domestic waste and filth, before it has time to enter into decomposition; and, with a well regulated, even if slight fall, every particle of the sewage of the town may be delivered at the outlet, far away from the built up districts, long before any decomposition of the refuse matter has set in."—WARING.

Hon. J. A. Chapman, Mayor of the City of Portland and
Gentlemen of the Common Council:

I beg to submit herewith the following report on a system of sewerage for this city.

I.

In preparing the plans and estimates for the methods recommended in this paper, with the reasons that have led to them, I am oppressed by the fact, that what is now presented is radically different from the system heretofore submitted to the judgment of our tax-payers, and must, on this account, be so elucidated that every citizen of fair intelligence may understand it, to appreciate its advantages over what has gone before.

The last quarter of a century is distinguished by such a revolutionary movement in hygienic theories and practices that the average duration of human life in the cities of Europe and America has advanced somewhat over two years. It is beyond doubt that we owe this fact to the genius and researches of the medical profession, who, especially in the countries mentioned, have directed their studies with singular success to the cause and prevention of disease and the conservation of health.

Discoveries, touching the frequent causes of enteric diseases; pollution of wells and other sources of water supply, impure air and sewer gases, and insufficient heat, have led to new household and municipal regulations, so that we have now a profession of educated sanitary engineers, by whom the science of that most interesting body of men, the physicians, has been developed into the practical arts of hygienic plumbing, drainage and ventilation.

The last decade of this quarter century has been especially marked by the popular diffusion of sanitary knowledge and the creation of devices by which human life can be kept clean; for this is all it amounts to; the immediate separation and removal of all the wastes and filth of life from our habitations; from the air we breathe, the water we drink and bathe in.

Such progress in the art of sewerage has taken place in this time, that we may congratulate ourselves on not being so deeply committed to an expensive and defective system like that of the great city of London, that, in the language of the distinguished engineer of the government board we are obliged to say; "the eloquence of an arch-angel would not avail to effect an improvement."

It would be strange, indeed, if the little city of Portland, situated on the western edge of the continent, and until now, isolated from eastern civilization were entirely prepared for the highest sanitary conditions. when an old and great commercial port, like Baltimore, which has enjoyed the dignity of paved streets for a century, is only in the infancy of a sewerage system; having but last year determined on its execution, though its population has reached 350,000.

Mr. C. H. Latrobe submitted a report on the subject in August, 1881, with estimates of cost to the amount of \$3,200,000 and made his report a complete treatise on the theory and practice of municipal sewerage and the necessity for sanitary reform, so essential was it deemed, that citizens should be educated, not only in the method but also the importance, of a safe disposition of the general filth.

When all the facts are considered, the average citizen of Portland would be ashamed to acknowledge such a condition as is stated of Baltimore by Mr. Latrobe, who declares there are 80,000 privies in that city many of which are from only six to eight feet deep.

By at least one factor, my task is greatly reduced when compared with the labor of many city engineers, who have gone before me.

I am not required to instruct the citizens of Portland by a treatise on sanitary engineering. No one who has spent the last year in this city will have failed to hear enough about "malaria," "sewer-gas" and a "bad system of drainage" as causes of disease and requirements of a better sanitary condition. It seems thoroughly well understood here that unventilated pipes from a sewer to the house or from a cess-pool, are dangerous conveniences leading disease and death in their train.

It is further understood that our present custom of leading sewers into the Willamette river on the city front is a radical error, believed to create typhoid along the banks of that stream.

Everybody appreciates this menace of the presence of filth to such an extent, that it is made the excuse for much illness, which is due to entirely distinct causes.

Nevertheless, with all the intelligence existing in this city; and intelligence in the direction of sanitary reforms, there are many blocks where a well furnishes water for the occupants and is surrounded by several privy vaults; and these cess-pools are often connected with the houses by what are called "modern improvements" in such a manner that no other ventilation is afforded than such as goes through the family apartments.

It cannot be necessary to instruct citizens concerning the evils of such a system and yet it is a condition existing in the houses of some of the wealthy men of Portland; an evil aggravated by the free use of water by which the surrounding soil is saturated. Neither should it be necessary to say

that a cistern, though an improvement on a well, is by no means a complete security against water pollution, when near a cesspool, as are several in this city.

II.

It has been declared on the one hand that Portland is without a drainage system, and on the other, that the existing system is a bad one.

It would be an error to give an unqualified assent to either the one or the other proposition.

In 1872, Mr. Wm. E. Morris, C. E. of Philadelphia, by invitation of a committee of the common council and of citizens, made an examination of our territory and devised a system of drainage quite abreast of the times; and in 1874 Mr. Robt. A. Habersham was called on to report concerning such a system and improved on the plans of Mr. Morris by several very intelligent suggestions in accordance with the later discoveries in the art.

Up to this time all plans have been designed to convey our sewage into the Willamette river, although Mr. Morris foresees that Portland may sometime in the future contain such a population as shall make it inexpedient to pollute the river with the city's filth and suggests that in such an event an intercepting sewer may be built along the city front to conduct the sewage to a point below the town.

It is plain, from this report, that in 1872 no liberal view had been generally taken of the possible future of this city. It is gravely set forth by Mr. Morris that sewers may have to be provided as far back as Eleventh street!

III.

The present custom in Portland is to place sewers in streets on the petition of property holders. These sewers consist of terra cotta pipes of which the dimensions appear to be arbitrary, and they are laid without inspection; that being impossible under the present economical organization of the street department.

All lines of pipe are on streets perpendicular to the course of the river into which they discharge their contents.

In the month of June when the floods of the Columbia river back up the Willamette, the mouth of every sewer is closed by the high water.

In the winter, during the rainy season, all this filth is carried safely away from the town, because, in those months there is a strong outward current; the river water is then of excellent quality. Already, the drainage of more than twenty streets with the wastes of 300 blocks or 500 acres finds its way to our river. So near as I can estimate, this sewage contains the wastes of about 12,000 lives.

The citizen who has taken the trouble to observe the Willamette in the season of the summer rise from the Columbia, will have found the direction of the current to set up stream past this city.

This phenomenon is not exceptional; it occurs every year and is made apparent to the most casual observation by the long lines of sawdust swept away from the mills to a point three miles above the city water works passing directly over the pumps that give us our supply of potable water and imparting the nauseating reflection that we are consuming in various ways the diluted excreta of 12,000 human beings besides the filth of all the domestic animals kept in the drained district with the added filth of the slops, offal and garbage of our kitchens.

The movement of this water in passing up stream under the summer sun is so sluggish, that if no extraneous filth entered the river, the organic matter contained in suspension is subjected to putrefying influence that can not but have a disastrous effect on the public health. So that, when this already bad condition is aggravated by the addition of every nastiness on 500 acres of city surface, and served up to us in our tea and soup; and drank with gusto in its unadorned purity is there any wonder at the phenomenal prevalence of diarrhoeal diseases during the summer months? Is it strange that our people complain of languor and headaches? Is it necessary to call up the bugbear of malaria, when we are charging our systems during three of the most trying months

of the year, with the insidious poison of a city's filth, the depressing and enervating effects of which, it is nearly impossible to shake off in the remaining nine months?

Is it strange that when the season of colds and congestions arrives so many debilitated systems surrender to typhoid?

While the evil thus stated is an important—may I not say a horrible—one, it is not the only danger. When the water on the city front, during the summer remains in this quiet condition, certain gross particles of filth not dissolved but held in suspension as well as the tainted liquid itself, assists to poison the earth of the shore and create an infecting, stinking sludge to be thrown open to the seething influence of the sun when the floods retire, producing a second source of disease.

But, during these months of flood, when, as previously stated no rain is falling and the ends of the sewers are closed, there is only the intermitting, ordinary, domestic water supply to keep them clean. I have lately had occasion to learn the insignificance of this amount for the ordinary purposes of cleansing. In the last month of November, after twenty-four hours of continuous though light rains, the greatest depth of flow in any sewer has been less than three inches and this was regarded as extraordinary; the truth being, that it was rare to find more than one inch and generally only a film of liquid running along the pipes.

In the summer, therefore, when the sewers must rely solely on the domestic water supply, they become elongated cess-pools and throw their poisonous gases on our atmosphere or into our houses.

The catch-basins, that are filled by the last rainy season with a rich deposit of rotting wood, street filth, dead cats and all unnameable things that reek, are dispensing the gases of putrefaction along the sewers for distribution in our houses or at the street corners.

This is a condition of things existing at the present time, while the district under consideration is, as compared with other cities, sparsely settled.

The time will come—and the child is already at school who will see it—when these 300 blocks will be closely built in small lots of twenty-five feet fronts and will shelter a population of 120,000 souls in place of the 12,000 now living there and the dangers of to-day will be multiplied ten-fold.

IV.

It is not due to the ignorance of our people, that the faulty system we have described is in existence and being continued.

The daily press of the city has continually called attention to its evils and private citizens have contributed innumerable communications on the subject.

A notable editorial leader appeared in the *Morning Standard* of September 26, showing much more familiarity with the late improvements in sewerage than is common with any but a professional sanitarian.

The difficulty in the way of a perfect system of sewers for Portland is of another character. It cannot be had without paying the cost; and the limited capacity of the public treasury considered with the apparent magnitude of an undertaking to construct a complete work has deterred the city government from the enterprise.

Now, however, the necessity has become crying and every interest unites in a clamor for immediate protection against the dangers to which the public health is exposed.

If, therefore, it were possible to command the means it seems desirable to begin the construction of a properly designed work.

V.

There are two well tried systems of sewerage before the world. To advocate either one, for adoption under all circumstances, would be as injudicious as the conduct of those who insist on one gauge of railroad for all regions and all classes of traffic.

The two systems are known respectively as the *combined* and the *separate*.

By the *combined* is meant a system of conduits, through which is conveyed all the refuse of a town of whatever kind, that can be moved by a current of water. Such refuse includes the wastes of life removed by the agency of water-closets; the slops of the kitchen; the rain water from roofs; the drainage of city garden irrigation surplus; the slops from the wash of porches and pavements; the liquid refuse of stables; the storm water, that falls upon the town with its varied cargo of whatever class; in short, everything that the population permits the water supply to carry off for domestic convenience and everything swept by the rainfall.

To do this work accurately has not yet been found possible. It has been attempted ever since sewers were first thought of and has invariably resulted in failure.

There is one universal difficulty, that of estimating the sewer capacity for discharging storm water. It would seem that men, who have made a constant study of such a subject should be out of the reach of failure. But the truth is, that when the engineer dares to state the dimensions necessary to conduct the exceptional floods of vehement thunder storms and what are known in this region as "cloud-bursts," his judgment is overruled by the fear of extravagance on the part of the authorities, who collect and disburse the taxes. And so failure has everywhere followed the attempt to carry away the water falling from the clouds in the same conduits that convey the sewage. Col. Geo. E. Waring, the distinguished American sanitary engineer read a paper before the American Public Health Association of New Orleans, in 1881, which has been quoted by Mr. Latrobe in his Baltimore report, in which he said of "London, the theater of the proudest achievements of the drainage engineer, a city whose intercepting sewers are a model for the world," that "many of the lower parishes are crying aloud for relief from the stinking floods with which the new sewerage system is deluging the poor inhabitants. The storm water has been gotten rid of with a vengeance; it has been robbed from the surface of the streets, where it would have done good service in flushing the gutters, and has been delivered into sewers of

great velocity, to accumulate, at the lower levels, far beyond the capacity of the pumps to remove it."

At a meeting of the Sanitary Institute of Great Britain held on the 23rd of September, 1880, a discussion was participated in by twelve members, during which, the distinguished chairman, Mr. Robert Rawlinson C. B., C. E., said: "Belgravia—the most fashionable part of London—notwithstanding the great expenditures on it, was subject to flooding in the basements from the sewers, and was the foulest part of all London. The sewers contained deposits and sewer gas." He also said that, "in the government buildings in Whitehall, the sewage was perceptible in the passages and that no beggar's lodging house was fouler than the basement of Somerset House."

Mr. Latrobe was commissioned by the municipality of Baltimore to visit various cities and learn from personal inspection, the character and condition of their drainage. He selected Brooklyn, N. Y., and Providence, R. I., because they presented the most elaborate and perfect illustrations, in the United States, of the "combined system of sewerage" the merits of which we are now examining.

I shall present the result of his investigation as briefly as the importance of the case will permit.

Brooklyn contains almost exactly 300 miles of sewers of which about 55 miles are of brick varying from 12 inches to 10 feet in diameter. The system cost nearly \$8,000,000 and notwithstanding the provisions made for a complete disposition of the storm water in the construction of these immense works, "not only in the lower parts of the city, but at points as high as seventy feet above tide, the sewage bursts out at the man-holes and floods cellars and basements, which have to be pumped out by the fire department."

The city engineer, Col. Julius W. Adams, said in a report on the 23rd December, 1870: "Your engineer has been aware for several years of the importance of improving the sewerage system. * * * * * The flooding of basements and cellars depreciates the value of property and endangers the lives of those occupying the flooded dwellings." Col.

Adams further said: "The lower portions of many districts are frequently inundated, and what is proposed is a system of interception of the sewage and storm water of the upper portion of such districts."

Mr. Latrobe found that the "catch basins admit large amounts of building refuse, and the condition of many of the mains is very bad. Cleaning by hand seems to be the principal method available and the solid matter is lifted from the man-holes in buckets and carted away for manure." Cleansing and repairing are difficult and expensive, costing about \$133 per mile per annum; and yet the sewers are not clean and sewer gas is much complained of in the houses." In view, therefore, of what he found in Brooklyn, Mr. Latrobe declares the combined system as there exhibited to be "overtaxed and unsatisfactory, notwithstanding its great cost and careful construction." Providence, R. I., has a population of 104,000. Its sewers designed by Mr. Herbert Shedd, civil engineer, are believed to be among the most perfectly planned and executed works in the country.

They consist of 28 miles of pipe and 15 miles of brick culverts, with 16 outlets into the harbor and rivers on which the town is located and had cost up to the end of 1880 the sum of \$1,500,000. The smallest sewer used is 12 inches diameter; the largest 5 feet 6 inches diameter.

The streets of Providence are kept exceptionally clean so that the catch basins are not choked by the street litter.

But, "the defects of the sewers of Providence are the same as those of Brooklyn, viz: an incapacity to carry off the storm water, even at elevations of one hundred feet above tide and consequent gorging resulting in deluged cellars, basements and streets, and the driving of sewer gases into the houses," so that with this elaborate system, which was to take care of both storm water and sewage in a single set of conduits, it has been found necessary "to throw a portion of the rainfall in violent storms over the surface of the streets; but while this relieves the sewers, it does what the sewers were built to prevent and as the surface gutters of

Providence are very shallow, and evidently not intended for surface drainage, the effect must be a flow over the greater part of the streets in violent storms."

In Providence as in Brooklyn, "additional storm sewers have been constructed and more are in contemplation, whilst ultimately a complete system of main intercepting sewers will have to be built, to gather up the sewage from the sixteen outlets now in existence and transport it to some points below the city, where it will not be foul and silt up the rivers and harbor."

VI.

As drainage systems for towns have been built before the general introduction of water supplies acting under considerable pressures and were first intended to simply relieve the streets from the rush of storm water and carry away only the surface filth, it was but natural that they should consist of great culverts for the ready conduct of floods.

They were a luxury confined to large cities with plethoric treasuries, and even in such cases were generally open on the surface and not conveyed under it.

The potable water of the town coming in aqueducts under a low head along lines of arches and in open ditches for the domestic necessities of the town was confined to the ordinary purposes of cooking and cleanliness; such as bathing, the work of the laundry, washing the dishes, the house and the pavements, and, the irrigation of the gardens of the rich. Then, convenient sinks were made to receive this waste and convey it to the street gutters, whence it reached the culverts that led it to some natural outfall.

Modern civilization has introduced the house water closet as the sequence of the use of potable water possessing sufficient head to exercise a scouring force.

Nothing could be more natural than to lead the new class of wastes of the house into channels already existing. But the result has been an unforeseen complication, arising from the deposit of dangerously putrefying filth in great culverts that could be cleansed only by storms.

The odors and diseases resulting from the passage of gases out of the sewers into the houses led to innumerable devices, prominent among which, are, "*traps*," which have caught a great many innocent house-holders and oftentimes nothing else, while the sewers have remained, a menace to the people.

In 1842, Mr. Edwin Chadwick, who had instigated many sanitary improvements in ventilation, cleanliness and drainage, and who is thought by Col. Waring entitled to rank as the "father of sanitation" in England, suggested, and supported the idea with "strong arguments, that household waste and matters of like character should be provided for, by a separate and distinct system of pipes." He has long been supported in his opinions by Mr. Robert Rawlinson, the Engineer of the Local Government Board of London, and beyond question the foremost man in his profession in England.

The result has been the development of the *separate system* of sewerage.

VII.

In the *separate* system, the wastes of the household—just so much as it is moved by the water supply—is conveyed to the outfall by a system of pipes into which none of the rainfall, not even that upon the roof is permitted to enter.

This system has been built in England under the advice of the distinguished men named above, in the towns of Pensance, Carlisle, Dover, Chelmsford, Ely, Rugby, Reading, Oxford, and Halstead with most satisfactory results. In some of these towns the old systems already existed; where this was the case they have been devoted to conveying only the storm water and the new pipes have been retained for domestic sewage.

Where old drains did not exist, the storm water has been distributed by systems of gutters along the surface of the streets, except that in some cases the roof water has been used to flush the sewers.

In the United States the *separate* system has been adopted

in Lenox, Massachusetts, where the roof water has been introduced for flushing purposes with good results in a region where rain falls every month in the year.

Later, the separate system has been applied in the town of Cumberland Mills, Maine, where it has been improved by the addition of automatic flushing tanks.

Its use has been extended to several considerable towns in the United States, among which may be named as either possessing or constructing it, Keene, N. H., Wilkesbarre, Penn., Pittsfield, Mass., Pullman, Ill., Kalamazoo, Mich., Omaha, Neb., Little Rock, Ark., Birmingham, Ala., Norfolk, Va., and notably at Memphis, Tenn.

The latest and most important application of the *separate* system is now in course of construction in the city of Baltimore.

VIII.

As the *separate* system was first carried to complete perfection in Memphis, Tenn., its defects patiently studied and remedied; and it has, after such corrections proven so thorough a success that not only is it being extensively adopted in our own country, but several European cities, Rome, Trieste, Naples, St. Petersburg and Paris are inaugurating experimental introductions to practically test the character of a system radically distinct from the ancient methods. I have been in communication with the authorities of Memphis and am indebted to Mr. Anthony Ross, Superintendent of Sewers, for very complete information, with plans and maps in detail; and the municipal regulations for house connections with the sewers besides a general description of the work and statement of results.

Mr. Latrobe, from whose report I have already freely quoted, made a personal inspection of the Memphis works and has given the result of his investigation with great fullness and clearness: I shall, therefore, here present *verbatim* what he has written on the subject.

"The city of Memphis is situated immediately on the Mississippi river and contains a population of 35,000. The

fatal epidemics of 1878 and 1879 made it necessary to take decided measures for draining and sewerage the city and abolishing the 7000 cesspools, which had contaminated and poisoned the soil."

Ten years before, Mr. Charles Hermany had presented several plans for such a work, varying in cost from \$800,000 to over \$2,225,000, depending upon the amount of storm water to be accommodated. This excessive cost, so far ahead of the capacity of the treasury in the impoverished condition of the city after 1879, led to the necessity of some more economical system.

"In this crisis Col. Waring was consulted and advised the adoption of the separate system for the disposal of the house sewerage alone, through impermeable pipes; common tile drains to be laid in the same trench for the drainage of the sub-soil; the storm water to be permitted to flow on the surface into the nearest water course."

After considerable opposition this plan was adopted, and on the 21st of January, 1880, the work was actually begun. The system is based upon a flow of about forty gallons of sewerage per head per diem."

"The main outlet sewer is twenty inches in diameter and built of brick; all the other sewers of burnt and glazed clay pipes, ranging from 15 inches to 6 inches in diameter; the latter being the size adopted for nearly all branch sewers."

"At the dead end of every branch sewer is placed an automatic flushing tank with a capacity of 112 gallons. Each tank is filled from the city water supply through a pipe and spigot so arranged as to flow continuously with a sufficient stream to fill this tank once in twenty-four hours, or oftener if desired."

"As soon as this tank is filled to the proper height, a syphon comes into play; the tank is suddenly emptied into the head of the sewer and thus prepares itself for another charge of water."

"There are, at this date, over twenty miles of sewer and one hundred and twenty-five flush tanks at work in Mem-

phis—the total cost of which, including expenditures of all kinds, has been about \$137,000 or \$6850 per mile.”

“The system is now being extended so as to take in the entire area of the city.”

“Of the 7000 cess-pools 5000 have, at this date, been emptied and filled with clay, while the others are being filled as rapidly as possible.”

“In my examination of the Memphis sewerage. I was accompanied by Major Humphries, the engineer in charge, who is thoroughly acquainted with every part of the work.”

“I first examined the flush tanks placed at the extreme ends of the branch lines. They fill and discharge with the most perfect regularity; there are literally no moving parts, and their extreme simplicity is manifest.”

“They consist of a brick chamber built on a concrete bottom of any size designed (those in Memphis being forty inches in diameter) set below the level of the street and covered like an ordinary man-hole with a perforated cover; in their center stands an anular syphon four inches in diameter.

“A three-quarter inch pipe near the top admits the city-water, the flow being governed by a spigot.”

“When the tank is filled to the bottom of the syphon the discharge takes place with a rush, the entire body of water (one hundred and twelve gallons) being discharged in from forty to fifty seconds.

“It first runs into a box under the syphon and from thence into the sewer head. As soon as the tank is emptied by the main syphon, its lower end is unsealed by a small syphon and the process of refilling the tank begins.”

“The only drawback to the perfect action of these tanks has arisen from the muddy character of the city water, which may be appreciated from the fact that a half-gallon pitcher will deposit during the night one half-inch of solid mud. This muddy deposit sometimes clogs the action of the subsidiary syphon which has a bore of only one inch. This difficulty has been obviated at Memphis by washing out the small syphon, say once a week, with a small hose about three feet long, put on the supply pipe of the tank—a

process which takes about ten minutes. One man attends to and keeps in order the entire lot of flush tanks, one hundred and forty-five in number, without difficulty.”

“The grade of the branch sewers, which are connected directly with the flush tanks, varies from six inches to three inches in the hundred feet; and the rush of water from the tanks is distinctly felt at a distance varying from four hundred to nine hundred feet, keeping the pipes perfectly clean.”

“No tendency to freeze has been noticed in the tanks, although the temperature has been as low as 4° the past winter.”

“These tanks are a patented article, and the city of Memphis paid ten dollars per tank for the privilege of building and using them. The total cost of building a tank, exclusive of royalty, has been forty-five dollars. I should say from observation they admirably fulfill their purpose, are thoroughly automatic in their action, and require very little attention.”

“Whenever it is practicable, the branch sewers of Memphis are located on alleys in the rear of the houses, so as to avoid the cutting of trenches in the streets. With the small sewers of the separate system, this is perfectly practicable, and prevents the necessity of carrying the house soil pipe to the front of the house.”

“I next gave close inspection to the condition of the main and outlet sewers, both to the fifteen inch pipe and twenty inch brick sewer.”

“This was readily done, as it had been found expedient to break into the crown of the main at several points for the purpose of constructing manholes. At the time of my inspection (11 A. M.) the sewers were running, three-fourths full, with a swift current. Nothing solid of any sort was to be detected in the flow even by dredging; an occasional piece of paper constituting the only undivided matter; every thing was in solution, and the sewage was about the color and consistence of the Mississippi river water.”

“Although in several places the entire crown of the sewer had been removed, it was difficult to detect any odor until

you were within two or three feet of the flow. Major Humphries stated that this was the uniform condition of the mains and that the ventilation seemed perfect."

"I would state in this connection that the main house pipe is required by law to be four inches in diameter, and to connect with the sewer without a trap, its upper end is then carried above the roof of the house, full size and left open; every water closet, kitchen-sink, bath-tub and waste-sink connects with this four inch pipe by a trapped connection of its own."

"The varying height of the four inch house mains, together with the constant flow of the sewage, stimulated by the intermittent discharge of the flush tanks, keeps the whole system well ventilated and in perfect order."

"The main and outlet sewers have an inclination of from one in 400 to one in 600 feet and the sewage is finally discharged into Wolf river, near its confluence with the Mississippi."

"To assist the ventilation and afford means for inspection, it was originally intended to place a fresh air inlet at every junction of a lateral sewer with the main; this is so arranged as to let in air and keep out dirt, and is covered with a grating. I found that out of forty provided only nine had been used from the belief that they were unnecessary. The only deposit which has ever been noticed in the mains is a fine silt, of moderate tenacity, supposed to be a mixture of the mud held in solution by the river water, combined with the pulp of dissolved paper. This is readily washed out by passing a ball from man-hole to man-hole. A hollow ball of galvanized iron having one inlet and stopper, and about three inches less in diameter than the sewer, is charged with water sufficient to keep it in contact with the roof along which it rolls; it is then dropped into the sewer at the man-hole, the current instantly gorges, rushes under the ball with great velocity, and scours the bottom of the sewer, the ball, in the meantime, rolls along the roof of the sewer, and is stopped, if desired, at the next man-hole, and taken out. Balls of different sizes are used

as desirable. The above mentioned deposit of silt in the mains has never been more than from one inch to one and a half inches in depth. The only obstructions which have occurred (thirteen in number) in the branch pipes during the twelve months in which the system has been in use, have invariably been occasioned by sticks about six inches long getting across the six inch pipe. The obstruction is immediately located by the rising of the sewage in the yard-waste-sink of the house just above it. The sewer is then uncovered at the proper place, cut open on the top, and the obstructions pulled out with a hook of twisted telegraph wire. This would seem to indicate beyond a doubt that any slender article, not over six inches long, might pass through a four inch trap; this is further proven by the fact that a number of two-foot carpenters rules, which fold to six inches, have been taken out of the sewers. This being so, the remedy would seem to be either to use no pipe less than seven inches in diameter, or to arrange the traps so as not to pass six inch sticks. No obstruction has ever taken place in the eight inch or ten inch pipes, or in the twelve inch, fifteen inch or twenty inch mains."

"I understand, from Major Humphries, that not a single case has occurred of the breaking of a pipe. The drainage of the sub-soil by common agricultural drain pipes, from one to three inches in diameter, is excellent. They are laid along side of the sewer-pipe in the same trench, and at the proper points are carried off to empty into the nearest water course."

"Now, as to the house arrangements, the regulations are stringent, no plumbing is allowed on any plan but that adopted by the authorities and carried out under a rigid inspection by the engineer, and no house is permitted to connect with the sewer until inspected and passed. Every outlet for waste is connected with the four inch house pipe, and trapped; a slop waste is insisted on for each house, so that nothing is thrown into the gutter or on the soil. No pan-closets or Brahma-closets are allowed where there is an air space between the trap and the pan; the use of some form

of hopper-closet is preferred. All connections with sewers are made by Y's and not by T's."

"The city lays a branch every twenty-four (24) feet, to the curb, to this the house-holder joins his iron four-inch pipe. This avoids tearing up the streets to make house connections."

"There has been, to this date, no complaint, in so far as I can find out, of sewer gas, and I cannot see how there could well be with so constant and rapid a flow of sewage, *thoroughly dissolved*, as was plainly visible in the mains. I learned from a prominent citizen and house-holder that the only inconvenience he had ever experienced arose from the breaking down, temporarily, of the water-works, which are on the Holly system, and which at the time depended on a single engine; for a few days he could not use his closets, for want of water."

"By gaugings taken at the head of the twenty inch mains, I found the hourly flow of sewage to be remarkably uniform. Thus from 6 A. M. till 1 A. M. the following morning, a period of twenty-four hours, the flow oscillated in centre depth from twelve and one-half to fourteen and one-half inches, the minimum area of flow being 206.5 square inches; the maximum, 245.73 square inches. From 1 A. M. until 5 A. M., a period of four hours, the centre depth of flow varied from eight and one-half inches to eleven and one-half inches; minimum area being 107.6 square inches; maximum area 186.9 square inches. Taking the twenty-four hours, the minimum flow is 43.7 per cent. of the maximum; taking the twenty-four hours of greater flow, the minimum is eighty-four per cent. of the maximum, and eight-ninths of the daily flow of sewage passed in twenty-four hours; one-ninth in four hours. This marked uniformity of flow during twenty-four hours of the day, and its oscillating character within such small limits, must be somewhat influenced by the action of the flush-tanks, which probably discharge in small groups."

"The force employed in maintaining the sewers alone, and its cost, I could not obtain accurately, as they were doing

much other work with the same men; but, approximately, a force of four men watch and keep in order the entire system, including the flushing-tanks, house ventilation, &c. All the work at Memphis has been admirably and faithfully done, under the immediate supervision of skilled engineer assistants."

"In summing up my impressions of the separate system as developed at Memphis, I would say: that it is well planned and well executed, and fully answers the purpose for which it was intended, and which I conceive to be primarily the object of all sewerage, viz.: to carry off all human and industrial waste with rapidity and cleanliness to its ultimate destination."

"The accompanying system of tile drains has also thoroughly drained (as far as I know) the very tenacious sub-soil of the city. As to the storm water at Memphis, it can safely be left, from all I learn, to take care of itself."

"The errors or omissions in the Memphis system are: *First*: Insufficient size in the mains to accommodate the excessive use or waste of water during severe winters, when people allow spigots to run all the time, to prevent freezing. During the winter just ended, Major Humphries estimates that one hundred gallons per capita per day were often used, which caused the mains to run full bore, and occasioned a backing up of the sewage in the lower parts of the city. This fault, of course, was not incident to all of the system, but was an oversight in proportioning the mains, and would not be felt during an ordinary winter.

Second: The omission of man-holes in the mains, as well as means of opening the small pipes, without breaking them, to remove obstructions which will sometimes occur. These omissions are now being remedied. Man-holes being constructed at every five hundred feet on the mains, and when a section of small pipe is broken into, it is replaced by a J shaped section, with a lid on the top of the upright stem of the J, which can be readily removed and the cleaning tool introduced. When these improvements are made, the system will be very complete. The want of size in the

mains, should it become an annoyance, can only be remedied either by duplicating them, or re-building them on a larger scale. I think an error has been made in not using the fresh-air inlets, as originally intended, at the junction of branch sewers with the mains. They are useful for ventilation and observation."

IX.

Under date of 1st September, 1883, I have received a communication prepared by Mr. Niles Meriwether, Engineer in charge of the sewers of Memphis and forwarded by the attention of Mr. Anthony Ross, Superintendent of Sewers, from which the following facts are taken for your information:

The population of the city of Memphis has increased from 35,000 to 50,000 since the construction of the sewers began in 1880.

To date, about forty miles of sewers have been laid, of which four miles are mains, discharging into the river by one outlet. The remainder are laterals draining into these mains, except four and one-tenth miles of sewers constructed before the present system was adopted and discharging into the Mississippi by other outlets.

The mains are ten, twelve, fifteen and twenty inches diameter. Of the laterals, about eighty-five per cent. are six inches in diameter and the remainder eight inches, except a few short lengths which are ten inches. The mains, for the most part, are laid with a grade of two inches in one hundred feet, which is the minimum.

The minimum grade of six inch laterals is six inches in one hundred feet.

At the upper end of each lateral is located one of Field's Automatic Flush Tanks, which discharges 112 gallons in about forty seconds. It will discharge as often as it is filled, but it is believed once in twenty-four hours is sufficient.

Man-holes distributed on the mains have been added since the system was otherwise complete, experience having demonstrated the necessity of them.

No surface or roof water is permitted to enter the sewers, the system being designed and proportioned for house sewerage only.

The house drains are all four inches in diameter, and no trap is permitted on the main drain, each fixture being provided with a separate trap. The soil-pipes are of cast-iron, with lead joints, above the ground, and extend four inches in diameter above the roof. Each house drain is consequently a ventilator for the public sewer.

For the purpose of removing the sub-soil water, agricultural drain tiles are laid in the trench with each lateral, on the grade of the sewers, or below it, which discharge, not into the sewers, but into the bayou. Additional lines of tile have been laid in streets where no sewer is located.

A large part of the trenching has been done by contract, but the pipes are laid by hired labor.

The six inch pipes, although draining houses on both sides, for a distance of three thousand feet, have never been over-charged, and have seldom been found running half full.

No trouble has been caused by sewer-gas, and the sewers are believed to be comparatively free from it.

Some of the six-inch pipes have occasionally been obstructed by sticks, bones, etc., becoming fixed across the diameter of the pipe, all of which have been promptly removed. Deposits found in the mains have been rapidly and inexpensively removed by the passage of hollow metal balls through them. These balls are about three inches less in diameter than the sewers, and, being lighter than water, are pressed against the top of the sewer and are rolled along by the force of the current. The velocity of the ball is less than that of the water, which in passing it, is deflected against the bottom and sides of the sewer so as to thoroughly cleanse it. A portion of the mains have been cleansed ten times since their construction, the laterals not at all.

Pipe laying was commenced about the 20th of January, 1880, and on July 1st of that year about twenty miles had

been laid. The first house-connections were made about March 1st of the same year.

Hourly observations in the twenty-inch main on 30th of April last, showed the greatest depth of flow $12\frac{3}{4}$ inches at 10 A. M.; least depth 8 inches at 2 A. M. On the 13th of June greatest depth 14 inches at 11 A. M.; least depth $10\frac{1}{4}$ inches at 4 A. M. Floats in the same sewer gave a surface velocity of 2 6-10 feet per second, the depth being $12\frac{1}{4}$ inches.

The following is a statement of the connections made with the system to date, but does not include those made with the old sewers discharging by outlets:

Water closets.....	4,950	Bath tubs.....	365
Sinks.....	3,467	Wash basins.....	321
Urinals.....	306	Privy sinks.....	37
Cellar drains.....	34		

The system of sewers appears to give entire satisfaction both to the city government and citizens generally."

The following has been enacted by the city government of Memphis as a

"HOUSE-CONNECTIONS ORDINANCE."

Section 1. Be it ordained by the legislative council, That it shall be a misdemeanor to do or cause to be done any of the following acts, except as herein provided, and any and all persons guilty thereof shall be fined not less than one nor more than fifty dollars.

Sub-Section 1. To uncover the public sewer for any purpose or make connections therewith, or uncover the public connection branches thereof, unless and except by the consent and under the supervision of the district engineer, or his duly authorized agent or agents, whose duty it shall be to insure full compliance with this ordinance in relation to connections, and a failure of duty in this respect shall subject such engineer or agents to all the penalties in this ordinance.

Sub-Sec. 2. To make, or cause to be made, any such connections except as above provided, and a competent and

skillful mechanic, duly licensed to do such work, by the legislative council, such mechanic not to be the agent of the district engineer or to make such connections in any other manner than as follows:

A.—Every pipe connecting with the sewer, whether of cast-iron or earthenware, must be sound and imperious in all its parts, and jointed in the best manner.

B.—Gaskets must be used in all cases; no other metal than cast-iron will be allowed, and joints in iron pipe must be of well-caulked lead.

C.—Cement pipe is not to be used, but earthenware pipes of the best quality, jointed with fresh strong cement mortar.

D.—These pipes to be laid at least two feet deep, and above that depth, the vertical pipes to be cast-iron, and all pipes from the sewer connection to the top of the soil pipe to be fully four inches in interior diameter at every point.

E.—No trap or any manner of obstruction to the free flow of air through the whole course of the drain and soil pipe to be allowed, and any mechanic who shall directly or indirectly place, make or cause or allow to be placed or made, any trap, contraction or other obstacle anywhere in the course of such pipe, in addition to the penalty herein prescribed, shall forfeit his license, and shall be ineligible to re-license for one year, and any other person offending as above shall be subject to the penalties of the ordinance, and shall, in addition, pay the costs of rectifying the wrong done.

F.—Every connection of a water-closet, sink-basin or other vessel connected with the pipe must be separated from it by a trap, offering an obstacle to the passage of air equal to not less than three-eighths of an inch depth of water.

G.—All details of plumbing work, such as water closets, sinks, etc., must be in accordance with the plans and descriptions in the office of the district engineer, bearing the approval of the consulting engineer or such other person as the legislative council may appoint.

Sub-Sec. 3. For the owner or occupant of any building, any portion of which is used for any purpose during any

portion of the day, to fail to have at least one water-closet connected with the public sewer fifteen days after notification from the engineer or president of the fire and police commissioners, and to fail to have such water-closet suitably arranged for use as a urinal, unless a separate urinal is provided.

Sub-Sec. 4. For the owner or occupant of any building in which food is cooked or clothing is washed, to fail to have a suitable sink, slop-stone or hopper for the reception of waste water; provided, however, that if the water-closet is of a kind suited to such use, may receive the waste water, and the sink, slop-stone or hopper may be dispensed with.

Sub-Sec. 5. To throw or allow to be thrown or deposited on the surface of the ground or in any hole or vault in or under the surface of the ground in the taxing district, whether public or private, except in the proper and necessary manuring of the soil, any water which has been used for domestic purposes, or any liquid or solid filth, or fæces or urine.

Sub-Sec. 6. To allow any surface water or rain water from the ground, or roofs of houses, to enter any sewer or drain or any vessel or slop-stone connected with any sewer or drain, or to admit any drainage water from any cellar to a sewer; provided, however, that drainage for cellars may be provided in accordance with the regulations, plans and descriptions in the engineer's office, and subject also to the restrictions of sub-section 1 of this ordinance.

Sub-sec. 7. To use or cause to be used any house drains for any other purposes than those specified in this ordinance, except by special permission from the legislative council.

Sub-Sec. 8. To throw or deposit, or cause or permit to be thrown or deposited, in any vessel or receptacle connected with a public sewer, any garbage, hair, ashes, fruit or vegetables, peelings or refuse, rags, cotton, cinders or any other matter or thing whatsoever, except fæces, urine, the necessary closet-paper and liquid house-slops. And it is hereby made the duty of all citizens to aid the police in bringing

offenders against this ordinance to punishment, and also to prevent breaches of the same. Passed March 4th, 1880.

D. T. PORTER,

Chairman Legislative Council.

Attest: C. L. PULLEN, Secretary."

X.

I have thus endeavored to make plain to your honorable body, the peculiarities of the two systems of sewerage and it now remains for me to state the effect of each system as applied to Portland.

So far as we have any system, it is of the class known as *combined*; the object being to carry away all sewage including storm water.

Its defects have already been stated and are the defects incidental to the system.

In the dry season the culverts are too large and masses of putrefying matter lie in the lower levels.

In the rainy season the culverts are too small and become gorged in the lower levels.

The difficulty of gauging sewers, to carry off storm water in Portland, may be recognized when it is known that the average maximum rain fall during a single day in the last twelve years has been a trifle under three inches; and that notwithstanding this, there has been one day—the 13th Dec. 1882—when six inches and seven-tenths fell.

So that if we had built to accommodate the maximum fall up to 1882 the great storm of that year would have demonstrated the insufficiency of our drainage.

These are the actual facts and are patent to all citizens, so that they do not need further statement or discussion in this report.

XI.

For the construction of the separate system, the city must be divided into several drainage districts of which,

the great intercepting mains will run towards the north receiving the contents of the laterals, which will run eastward.

The high water of the Columbia backs up the Willamette to a maximum height of 22 feet above the base of grades. Assuming a fall of one foot in two thousand for an outfall conduit to convey the sewage to the dyke in the Willamette slough, where there always exists a strong outward current, we find that all points of the city higher than 34 feet above base may be drained by gravitation into that water when the Columbia river floods are at their highest.

Lower levels must be drained into a receiving tank or tanks and pumped thence into the higher outfall conduit for transportation to the slough.

If my information is correct, there are now three millions of gallons of water in daily use in Portland while the population is rapidly increasing. At Memphis a provision was made for delivering an amount equal to forty gallons per head of the population and it is now found that at certain seasons it is necessary to discharge 100 gallons per head.

In view of these facts and considering that the water supply is really the measure of the quantity of sewage, it has seemed prudent to estimate for an outfall conduit, of sufficient capacity for the conveyance of seven million gallons daily, being sufficient for a population of 100,000 inhabitants using daily 100 gallons a head of which two-thirds may enter the sewers.

The conduit necessary for such a duty on a grade of one foot in two thousand would have an inside diameter of thirty inches running full. But for greater safety, the estimate is submitted for a conduit running but two-thirds full, which would have a diameter of thirty-six inches.

As the flow would be very uniform in depth the section of the outfall conduit may be a circular ring of brick. It will be 40,000 feet long.

The accompanying map shows the division of the city into drainage districts determined by the topography, the whole tracts being estimated to use 10,000,000 gallons of

water for domestic purposes distributed uniformly over the territory.

District No. 1, lying on the ground along the river and comprising about three-twentieths of the territory (230 acres) will be drained by a 15-inch pipe sewer, extending along Front street from Yamhill to the intersection of S and Eleventh streets. This pipe will be 8,200 feet long with a uniform fall of 1.76 feet in 1,000; all below the high water line of summer floods and will be required to pass 1,000,000 gallons per day.

District No. 2 is west of No. 1, comprises about six-twentieths of the city tracts (450 acres) and will be drained by a similar 15-inch pipe sewer. As it lies along the western edge of the low flat portion of the city, it will be below the high water of summer floods, for all that portion north of Madison street. This pipe will be 10,900 feet long, extending from Market and Front streets, and following a topographical contour line as nearly as practicable to the intersection of S and Eleventh streets, with a total fall of 49.7 feet all below the hydraulic grade line, being a fall of 4.5 feet in 1,000. Its duty calculated as in the preceding case will be 2,100,000 gallons per day.

NOTE.—The two intercepting sewers of the first and second districts will unite at S and Eleventh and discharge into a 24-inch pipe running 1600 feet along Front street to the intersection of W and Sixteenth streets, where all the low level sewers will discharge into a pumping well.

District No. 3 lies to the south of No. 2 and is included between Front and Seventh streets, comprising about three-twentieths of the city tract (230 acres). It will be drained by a 12-inch pipe sewer running along Front to Market and zigzagging thence as nearly as practicable along a uniform grade line to the intersection of Taylor and Seventh. It will be 5,820 feet long and fall 48 feet all below the hydraulic grade line; being 8.25 feet in 1,000. Its duty is calculated at 1,100,000 gallons.

District No. 4 lies west of No. 3 and being all above Seventh street comprises about three-twentieths of the ter-

ritory (230 acres). It will be drained by a 10-inch pipe 4,120 feet long running along Seventh street to its intersection with Taylor and falling 137 feet, all below a hydraulic grade line or 33.25 feet in 1,000. Its duty is calculated at 1,500,000 gallons.

NOTE.—The two intercepting sewers of Districts Nos. 3 and 4 unite at the intersection of Taylor and Seventh, and discharge into a 24-inch pipe, which, in addition to carrying the drainage of these two districts amounting to 2,000,000 gallons, must also drain

District No. 5, which lies north of Taylor street and west of District No. 2, comprising about five-twentieths (400 acres) of the city tract and demanding a duty of 1,700,000 gallons or an aggregate of 3,700,000 gallons. This pipe will be 11,400 feet long, falling 8 feet or 0.7 feet in 1,000.

XIII.

Lateral sewers should be laid under the streets that run from west to east entering the intercepting pipes along the lower edge of their respective districts by curves of not less than thirty feet radius.

In all but district No. 1, lying on flat ground along the river, as previously described, six-inch pipes for branches would be ample to pass the sewage; but the Memphis experience being clear, that this size of pipe is liable to obstructions, from sticks and especially carpenters two-foot rules, which fold to six-inch lengths while no such difficulty occurs with those of eight-inch diameter, it has seemed expedient to adopt this dimension, eight inches, for a minimum, unless indeed some provision can be made in house traps by which such objects can be removed before they enter the system.

In the lower districts eight inches will be the proper size for laterals, and thus all the street service sewers of the city will be of uniform dimensions.

Four inches diameter has been found suitable for house branches which are connected with street sewers without traps and are carried three or four feet in the same size above the roof of the house, which they serve. They should

always connect with a lateral and never be permitted to enter a main. While it is an advantage to pursue the custom sometimes adopted, of laying house branches up to the curb of sidewalks, the expense is so considerable that I am not free to recommend it in this case. But, apart from the question of expense, Portland is subject to a peculiar difficulty in the way of apportioning such a distribution of pipes so that I have not made any estimate of its cost. The city has been laid out to give the extraordinary width of fifty feet front, to house lots.

So fixed is the prejudice of our people against crowding and in favor of little lawns and gardens, that men go continually farther and farther from the city centre to reside, rather than live upon twenty-five feet lots. Yet all observing men, noting what is going on in the business districts, recognize that as property becomes more valuable, lots will be subdivided.

To meet the difficulty, I may properly advise that in laying the street service it shall be provided with capped Y branches at every lot of fifty feet to accommodate two four-inch house branches; thus avoiding the system of breaking into the sewers. Of course it should be made obligatory that all house connections be made with this Y branch. This plan is to a certain extent followed at the present time in Portland.

XIV.

An important adjunct of the system will be the use of automatic flushing tanks and drain tiles.

Flushing tanks are placed at the head of laterals. In Memphis, they are made to hold 112 gallons each and are so connected by a spigot with a small pipe from the water supply system of the city as to fill once in 24 hours. A syphon, entering the head of the sewer, operates to empty the tank the instant it is filled; an operation occupying but forty seconds and by means of which the pipes are cleansed of all putrefying matter.

Drain tiles are placed in the trench with the sewers; they are led to the nearest water course without reference to the sewer outfall. As leakages are liable to occur in the best constructed work and as an excavated trench however well refilled will always gather water from the neighboring earth, these tiles prevent the unwholesome saturation of the soil and do much to remove the dampness proceeding from rains and the consequent humidity of the atmosphere. They are inexpensive in cost and labor, being but one-inch diameter along the laterals to three inches under the mains.

Manholes will be required at distances of about 560 feet apart or one at the corner of alternate blocks on the main pipes.

Fresh air inlets should be placed at the points of connection between the laterals and mains. Where the mains change direction between manholes a fresh air inlet will be convenient to assist observation by a cheaper means than a manhole.

Hand holes may be placed at each street intersection of the laterals by the insertion, at time of construction, of a vertical T, covered with a lid easily removed for the insertion of the pill or wire used in cleaning.

XV.

Having considered the construction of the new system in full detail, it becomes necessary to make a disposition of the storm water falling on the city; and of the old sewers.

Storm water is at present conducted along street gutters to catch basins for delivery to the sewers.

Such economy has been practiced in the disposition of gutters in Portland, that excessive volumes of water are concentrated in some single lines endangering the safety and permanence of streets and impeding traffic.

After a careful study of the streets and grades it appears that by a judicious distribution of gutters all storm water may be carried upon the surface without inconvenience to traffic or danger to property; and may be allowed to run

into its natural outfall, which is ultimately the Willamette river.

It should be kept in mind that our rains, washing the filth from the streets, occur in winter when there is a strong outward current in the river; whereas in summer, when the Willamette is backed up, there are no rains to speak of and therefore no danger of polluting the river by surface filth.

In the lower parts of the city, where the street grades are flat, it is essential to build the gutters with especial attention to their accuracy for obtaining free action.

There is one advantage of the interposition of this flat territory, between the hills and the river, that I have never seen noticed, though it is of immense value to a town located on navigable water; it is, that material brought down the steep side-hill gutters by the rapid velocity of the streams will drop or deposit the heavier portion upon the lower streets whence it is easily removed, instead of depositing it in the river to be excavated by the expensive system of dredging. Such material as is carried to the river by so low a velocity as that encountered in the flat streets will be conveyed well out of the Willamette by its strong winter current.

The old sewers amounting to an extent of twelve and a half miles and built at a cost of \$97,940 or about \$8,000 per mile, cannot be properly thrown away and need not be, as, with some inconsiderable outlay they may be adapted to the new system, for which I have so arranged the grades of the intercepting sewers that the existing lines may be admitted to them. As they will be larger than required by the new duty they will have to perform it is advisable that the flushing tanks should have a greater capacity for flooding them, than is used in the new pipes.

But they cannot be let into the new mains without throwing the catch-basins into disuse; which should, to this end, be disconnected and closed up, while, at the same time good gutters are provided along the streets for the storm water.

XVI.

I have thus, as briefly as is consistent with a clear explanation of the subject, described the system of sewerage, which I respectfully recommend for adoption, to your honorable body, and nothing remains to fulfill this part of my duty but to present estimates of the cost, premising that the expenditure will be progressive, extending over as long a term of years as may be deemed proper; taking care only, that whatever sewer is built shall be a correct feature of the general plan.

But I do most earnestly recommend that the present system of emptying sewage into the river and thus polluting the water supply be corrected before the next June floods in the Columbia river, by the construction of the necessary intercepting sewers and the outfall conduit to the Willamette slough.

In this connection it is proper to say that the kitchen gardens in the city and its suburbs are using the city sewage wherever there is a means of deflecting it to the purpose, so that a discussion of the fertilizing value of the material would be a superfluous work to a citizen of Portland. That portion of country through which the outfall culvert must run is low and is now being developed to some extent for gardening. It is very likely therefore that the sewage may soon find a market before reaching the river.

XVII.

Estimate of the cost of sewerage Portland by means of the separate system.

District No. 1 comprises the lowest portion of the city territory where the sewers thus far laid are placed so deep that it will be cheaper to lay new drains than to raise the old, while the latter may be availed of to convey storm water.

The estimate therefore contemplates the sewerage of the whole district and is as follows:

MAIN.

8,200 lin. ft. 15-inch sewer laid at \$1.00 per lin. ft.	\$ 8,200 00
“ “ 3-inch agricultural drain pipes at 3 cents per foot	246 00
25 Y branches for laterals 15x8 at \$1 20 each in excess of the plain pipe which they supercede	30 00
25 air inlets with iron gratings at \$7 00 each	175 00
15 manholes with iron gratings at \$50 00 each	750 00
5,000 cubic yards excavation and hack-filling at 25 cents per yard	1,250 00
Total cost of main for District No. 1	\$10,651 00

LATERALS.

42,100 lin. feet of 8-inch lateral sewer pipe at 50 cents per foot	\$21,050 00
42,100 lin. feet of 2-inch agricultural drain at 2½ cents per foot	1,052 00
24,000 cubic yards excavation and hack-filling at 25 cents per yard	6,000 00
1,200 double Y branches 8x14, to receive house drains, at an excess over plain pipe which they supercede of \$1 50 each	1,800 00
25 flushing tanks to be placed at head of laterals at \$50 00	1,250 00
150 covered T branches to sewer as hand holes at \$2 00 each	300 00
Total cost of laterals for District No. 1	\$31,452 00

Aggregate cost of mains and laterals in District No. 1, \$42,103 for 50,300 feet of sewer; being about 84 cents per foot or \$4,420 per mile.

District No. 2 already contains sewers on sixteen streets, which may be connected with the new system through the 15-inch main. The ultimate of the district will be as follows:

MAIN.

10,900 lin. feet 15-inch sewer laid at \$1 00 per ft.	\$10,900 00
10,900 lin. feet 3-inch agricultural drain tile at 3 cents per foot	327 00
180 Y branches for laterals 15x8 at \$1 20 each in excess of plain pipe, which they supercede	216 00
9 Y branches 15x15 to receive old sewers at \$3 00 each	27 00
6 Y branches 15x12 to receive old sewers at \$3 00 each	18 00
41 air inlets with iron gratings at \$7 00 each	287 00
23 manholes " " " " \$50 00 each	1,150 00
7,600 cubic yards excavation and back filling at 25 per yard	1,900 00
1,200 lin. feet of 24-inch main to convey discharge of Districts Nos. 1 and 2 to pump well at \$4 00	4,800 00
1,200 lin. feet 3-inch agricultural drain pipe at 3 cents per foot	36 00
4 Y branches for laterals 24x8 at \$ 3 00 each	12 00
1 manhole with iron grating at 50 00 "	50 00
4 air inlets " " " " 7 00 "	28 00
1,800 cubic yards excavation and back filling at 25 cents per yard	450 00

Total cost of mains for District No. 2....\$20,201 00

LATERALS.

43,200 lin. ft. of 8-inch sewer pipe at 50c. per foot	\$21,600 00
43,200 " " 2-inch agricultural drain pipe at 2 cents per foot	864 00
22,000 cubic yards excavation and hack filling at 25 cents per yard	5,500 00
1,248 double Y branches 8x4 to receive house drains, at an excess of cost over plain pipe which they supercede, of \$1 50 each	1,872 00
34 flushing tanks at heads of laterals \$50 00 each	1,700 00

130 covered T branches to serve as hand holes \$2 00 each	260 00
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Total cost of laterals for District No. 2...\$31,796 00

ADJUSTMENT OF OLD SEWERS TO NEW SYSTEM.

Work of excavating and back filling on 15 old sewers at \$100 00 each	\$ 1,500 00
Cutting off or shutting up 75 catch basins at \$10 00 each	750 00

Total cost of District No. 2.....\$54,247 00

Of this amount \$9,330 concerns 5,300 feet of that part of the main laid to receive the old sewers; the balance of \$44,917 is the cost of putting in 48,800 feet of main and laterals all of the new system, being a cost of 92½ cents per lineal foot or \$4,884 per mile, for the new work.

District No. 3 already contains sewers on nine streets, which may be connected with the new system through the 12-inch main. The estimate of the District will be as follows:

MAINS.

5,400 lin. feet 12-inch sewer laid 65c. per lin. foot	\$ 3,501 00
5,400 " " 3-inch agricultural drain tile at 3 cents per foot	162 00
7 Y branches 12x8 at \$1 00 each	7 00
7 branches 12x12 to connect with old sewers \$1 00	7 00
1 branch 12x10 " " " " 1 00	1 00
1 " 12x15 " " " " 1 00	1 00
23 air inlets with iron gratings at \$ 7 00	161 00
91 manholes " " " " 50 00	4,550 00
4,400 cubic yards excavation and back filling at 25 cents per yard	1,100 00

Total cost of mains.....\$ 9,490 00

LATERALS.

15,000 lin. feet 8-inch lateral sewer at 50c. per ft.	\$ 7,500 00
15,000 lin. feet drain tiles 1-inch at 1½c. per foot.	225 00
12,000 cubic yards excavation and back filling at 25 cents per yard.	3,000 00
700 double T branches 8x4 to receive house drains of cost over plain pipe which they supercede, of \$1 50 each.	1,050 00
18 flushing tanks at \$50 00 each.	900 00
48 covered T branches to serve as hand holes at \$2 00 each.	96 00
Total cost of laterals.	\$12,771 00

ADJUSTMENT OF OLD SEWERS TO NEW SYSTEMS.

Work of excavating and back filling on old sewers at \$100 00 each.	900 00
Cutting off or shutting up 32 catch basins at \$10 each.	320 00
	<u>\$ 1,220 00</u>

Total cost of District No. 3.....\$23,481 00

Being about \$1 15 per lineal foot on mains and laterals of new systems or \$6,072 per mile, of which it may be remarked, that a considerable part of this estimate is for new main passing and receiving old sewers.

District No. 4 occupies in part the highest ground in the city and is a tract on which settlement is extending towards the west and south. The lower section of the district is in the heart of the city, while the southern and western sections are in the suburbs. This estimate is therefore limited to the territory bounded by Grant street on the south, and Twelfth on the west.

As the city is rapidly increasing in population, which extends towards the west and south in this district, I have thought it prudent to estimate for portable, wrought-iron

flushing tanks, which may be moved forward as the sewers are extended; but, for this purpose wooden barrels or tierces may be used as long as their duration is temporary. The estimate for the district will be as follows:

MAINS.

4,120 lin. feet 10-inch sewer laid 50c. per foot.	\$ 2,060 00
4,120 " " 2 " drain tiles at 2c. per foot.	82 00
10 Y branches 10x8 at \$1 00 each.	10 00
8 " " 10x12 to receive old sewers	\$1 00 8 00
1 " " 10x10 " " " "	1 00 1 00
19 air inlets at \$7 00 each.	133 00
7 manholes at \$50 00 each.	350 00
4,000 cubic yards excavation and back filling at 25 cents per yard.	1,000 00
Total cost of mains	\$ 3,644 00

LATERALS.

23,400 lin. feet 8-inch lateral sewer at 50c. per ft.	\$11,700 00
" " " 1 " drain tiles 1½c per foot.	351 00
20,000 cubic yards excavation and back filling at 25 cents per yard.	5,000 00
560 double Y branches 8x4 to receive house drains of cost over plain pipe which they supercede at \$1 50 each.	840 00
19 flushing tanks at \$50 00 each.	950 00
113 covered T branches to serve as hand holes at \$2 00 each.	226 00
Total cost of laterals.	\$19,067 00

ADJUSTMENT OF OLD SEWERS TO NEW SYSTEM.

Work of excavating and back filling eight old sewers at \$100 00 each.	\$ 800 00
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Cutting off or shutting up 35 catch basins at \$10 each..... 350 00

\$ 1,150 00

Total cost of District No. 4..... \$23,891 00

Being about 85 cents per lineal foot of mains and laterals or \$4,488 per mile.

District No. 5, like No. 4, occupies land extending towards and well up to the hills the western section of which is as yet but sparsely populated. This section may, also, properly be provided with portable iron flushing tanks. The estimate is for a territory extending west to Twenty-first street, and north to V; and is as follows:

MAINS.

11,400 lineal feet of brick sewer (single ring running 17 lineal feet per M of brick) \$1 50 laid per lineal foot, this price to include extra work of cutting out invert..... \$17,100 00

11,400 lineal feet of drain tiles 3-inch at 3 cents per foot..... 342 00

26 branches to receive all "laterals (being single lengths of 8-inch or other pipe, excess of cost for laying, over and above lineal measurement, which is included in estimate for laterals) \$1 00 each..... 26 00

26 air inlets at \$ 7 00 each..... 182 00

19 man holes 50 00 "..... 950 00

16,000 cubic yards excavation and back filling at 25 cents per yard..... 3,750 00

Total cost of mains..... \$22,350 00

LATERALS.

47,200 lin. ft. of 8-inch lateral sewer at 50c. per ft. \$23,600 00

" " " 1 " drain tiles at 1 cent per ft. 472 00

40,000 cubic yards excavation and back filling at 25 cents per yard..... \$10,000 00

1,344 double Y branches 8x4 to receive house drains at \$1 50 per branch..... 2,016 00

26 flushing tanks at \$50 00 each..... 1,300 00

99 covered T branches to serve as hand holes at \$2 00 each..... 198 00

Total cost of laterals..... \$37,586 00

ADJUSTMENT OF OLD SEWERS TO NEW SYSTEM.

Work of excavating and back filling three old sewers at \$100 00 each..... \$ 300 00

Cutting off and shutting up fourteen catch basins at \$10 00 each..... 140 00

\$ 440 00

Total cost of District No. 5..... \$60,376 00

Being about \$1.03 per lineal foot or \$5,440 per mile.

Pumps and Outfall.—It has already been explained that Districts Nos. 1 and 2 will drain into a pumping well at the intersection of W and Sixteenth streets whence the sewage will be raised to the head of the outfall conduit at the intersection of V and Twentieth streets.

The maximum for which I have made provision in the sewers will be 3,000,000 gallons per day, but no such duty as this will be required of the pumps for a long time.

At first, the pumps, probably for the next three to five years, will not receive the sewage of the entire district, the work of laying and completing such drainage being likely to occupy that length of time; but when the sewers are all in, it is well understood that the districts will not yet have received their full population. In this view of the case therefore I have thought it well to estimate for a small pump and engine in the beginning; and another similar set of machinery may be placed in position when it becomes neces-

sary to be augmented as the requirements increase. At present, if the whole of the two districts were sewered the pumps would have to raise but about two-thirds of 1,350,000 or 900,000. I believe, however, that a present pumping capacity of one-half that value or 500,000 gallons per day will be ample for a few years; being 350 gallons per minute. It is proper also to say that the pumping from this well will be required only when the Willamette is too high to allow natural outlet for the water and sewage; until the river shores below and near the town have become so populated as to forbid pollution of its waters below as well as above the town.

The estimate for machinery, etc., will be as follows, as nearly as I am able to determine:

Land for Works 50x100.....	\$ 3,000 00
Pumping engine, Gaskell's Duplex pump with boiler, foundations, well, house, coal bunkers, etc., for a duty of raising 500,000 gallons a day from the height of 16 feet above base of city grades to 43 feet above same base.....	12,000 00
Pump main from pump to outfall conduit 2,000 lin. feet of 10-inch iron pipe laid at \$1 50 per ft.....	3,000 00
Excavation and back filling 500 cubic yards at 25 cents per yard.....	150 00
Total cost of pumping sewage from low to high level.....	\$18,150,00
Cutfall from pump well to river for use in seasons of low water.....	1,200 00
	<hr/>
	\$19,350 00
Outfall from end of pump main to Willamette slough.	
Tank and gates.....	\$ 1,000 00
40,000 lin. feet of brick circle 36-inch inside diameter 2,542 M of brick at \$1 00 per M.....	38,130 00
75 manholes with iron gratings at \$30 00.....	2,250 00
55,000 cubic yards of excavation and back filling at 20 cents per yard.....	11,000 00

Special works on account of low lands and water courses.....	5,000 00
Right of way through private property to the slough.....	10,000 00
	<hr/>
	\$67,380 00

SUMMARY OF ESTIMATES.

Sewerage of District No. 1.....	\$ 42,103 00
“ “ “ “ 2.....	54,247 00
“ “ “ “ 3.....	23,481 00
“ “ “ “ 4.....	23,861 00
“ “ “ “ 5.....	60,376 00
Pumping machinery and appurtenances.....	18,150 00
Outfall conduit from pumping well to river.....	1,200 00
Outfall conduit from high level to Willamette slough.....	67,380 00
	<hr/>
Total cost of completed works.....	\$290,798 00
Add 20 per cent. for superintendence, engineering, changes in prices, insurance, contingencies and unforeseen accidents.....	58,160 00
	<hr/>
Total.....	\$348,958 00

This sum of about \$350,000 is what I suppose it will cost to build a complete system for all that part of the city territory over which improvements and settlement have thus far extended, comprising about 1,500 acres.

But no one would think of suggesting that so extensive a scheme should be executed immediately with our limited population.

If, however, we are to save this town from disease by pollution of the river, the mains must be built and the present sewers conducted below the town.

XVIII.

The prominent and greatest objection to this system of sewerage, that will suggest itself to the citizen is the disposition of the surface water.

This has been the universal objection, wherever the separate system has been recommended; but it has finally given way before continued, intelligent discussion.

When this fact is stated to a resident of Portland, his invariable reply is, that other places do not have so great a rainfall as this town, which is a popular mistake, if it were important, which it is not.

The true question is concerning the quantity of water that falls in any one shower of short duration; and a peculiarity of our rainfall is lack of violence, when compared with other regions.

It is certainly true that we have a few heavy showers; but it is equally true that when we have had such showers our culverts have failed to carry their fall away in safety; they invariably become gorged.

It is claimed that the lower streets were made impassable by rain water before the sewers, such as they are, were built; and it is said that this was in spite of good gutters. I have heard this claim made by respectable citizens, whom it is not pleasant to dispute. Nevertheless, the truth is, that no system of gutters has ever been designed or built for this city, *i. e.*, no proper distribution of storm water has been designed by which every side of every street has been made to take a share of the rainfall. On the contrary, the custom has been and still is, to concentrate the flow of water into a single line of gutter by which it shall be led to a catch-basin.

If the rainfall were distributed as it should be, by the construction of gutters on both sides of all streets, the gorging of a gutter would be of little moment, since the water, at that point, would always have a second channel to serve as a waste weir. I repeat, what I said above, that whatever detritus is left on the streets, is so much saved from the

river to be taken out by the expensive system of dredging, if allowed to enter that stream. Concerning this subject of surface drains it is only necessary to add that excellent and ample gutters can be built in this city, of stone blocks for \$1,000 a mile; and that we are paying \$800 a mile for insufficient open plank gutters.

XIX.

I have thus, gentlemen, fulfilled the duty you assigned me of devising a system of sewerage for Portland. There is nothing original or new in what I have submitted; everything has passed out of experiment and become established truth. I claim, only, that under the light of large experience in this branch of my profession, I have industriously and impartially studied the latest improvements in sanitary art and have allowed no opportunity for learning the results of the best experience to pass unheeded.

All of which is respectfully submitted by your obedient servant,

ALFRED F. SEARS, C. E.

REPORT OF THE SUPERINTENDENT OF THE DREDGER.

To the Hon. Mayor and Common Council of the City of Portland :

GENTLEMEN :—Herewith please find report of the City Dredger since I had the honor of taking charge of the same. On February 15, 1883, I commenced getting ready, and on the 20th commenced work :

Removed during February.....	4,400	yards of dirt.
“ “ March.....	6,500	“ “
“ “ April.....	7,150	“ “
“ to 15th of May.....	1,900	“ “
“ during August.....	14,880	“ “
“ “ September.....	16,770	“ “
“ “ October.....	15,960	“ “
“ “ November.....	14,520	“ “
“ to 15th of December.....	7,320	“ “

Making a total of..... 89,400 “ “

During one-half of May, and all of June and July, was laid up on account of high water.

During that time the running expenses were, including the wood, \$15,530 or 17½ cents per yard. During this time I have made some changes and had to do considerable repairing on the dump scows, and all repairs and improvements and equipments, including links, have cost \$5,496, which increases the cost of removing the dirt to 23 6-10 cents per yard. In my opinion the next year will show better results in work, and much less in repairs and improvements, as everything is about as handily arranged as it can well be. I cannot attempt to say how many stumps and large logs we have removed that were in the channel, but can say safely, that at least six of them were each as good as 3,000 yards, these are what have caused all the breaks we have had.

I am working at present at the extreme upper end of Swan Island bar. There is a channel from 100 to 150 feet wide, and 18 feet deep, at low water, all the way across it, but in my opinion it needs straightening, I having followed the deepest water to get over as soon as possible. Most of the part gone over will have 20 feet in depth at zero of the gauge. I would recommend that you make some arrangements so that the Dredger could be put to work on Post Office bar, as that in my opinion, will give more trouble than Swan Island another year.

GEO. A. PEASE.
Superintendent City Dredger.

REPORT OF CHIEF ENGINEER, P. P. F. D.

PORTLAND, Or., December 31, 1883.

To the Hon. Board of Fire Commissioners of the City of Portland :

GENTLEMEN :—I have the honor to submit to you the first annual report of the condition and operation of the Paid Fire Department of the city of Portland, for fiscal year ending December 31, 1883, which is a complete record of the workings and expenses of the Department, together with all fire losses during the year.

The total losses on real and personal property, for year just closed reached the very large amount of \$308,092.20. The greater portion of this loss was caused by the Corbitt & Macleay and Nicolai Block fires, aggregating a loss of \$243,-265.22. The first fire or fires, occurring at 4 A. M. January 17, was the wholesale grocery house of Corbitt & Macleay, two-story brick running through Block 34, from Front to First streets, and the frame buildings on corner of First and Oak streets. The alarm was sent in for both fires at same time from Box 15, thereby necessitating the division of our forces. It was undoubtedly the coldest night that a fire ever occurred in this city, and tried our infant Department to its utmost. Both fires burned fiercely at same time, and seriously threatened to become a conflagration. The Corbitt & Macleay fire had undoubtedly been burning for a long time, as when discovered the flames were issuing through the roof and windows ; but the Department proved equal to the emergency, and confined both fires to the buildings in which they originated, thereby gaining the confidence of the citizens. That, although working under the new system, it being our first working fire, the Department was ready, willing and efficient, and I am happy to say that after the year's experience we still retain their confidence. One of the re-

serve engines (second-class Amoskeag), that was brought out immediately after the alarm, worked thirty-four consecutive hours at this fire. The loss on both these fires amounted to \$175,000.00.

The second large fire was the Grand Stables and buildings on Block 18, bounded by Second, Third, C and D streets, July 17 : time, 7.05 P. M. ; Box 14. The fire is supposed to have started in the furniture factory, but the combustible nature of the buildings and contents caused it to burn so rapidly that when the alarm was turned in, the stable was also on fire ; and being a three-story frame building, 200x50 feet, it conveyed the fire the entire length of the block in a very few minutes, and causing the fire to spread on both sides, to the Richmond and Nicolai hotels and three dwellings, which were totally destroyed. The fire burned with such fierceness that the united efforts of the Department were required to keep it from spreading across the street, there being at one time a wall of fire on Second street one hundred feet long by sixty feet high. The only building on the block saved was the brick, 100x50, with contents, valued at \$60,000 ; although on fire several times, by the strenuous efforts of the Department, it was saved. And I must say, considering the surroundings, the buildings on the opposite side of the street being built wholly of wood, and the scarcity of water in that locality, having to move an engine to the river and lay 1,000 feet of hose, when the fire was burning its fiercest, that the lower portion of the city had a narrow escape. But the laying of a 14-inch water main and erection of a line of hydrants on Third street, furnishes a never-failing supply of water in that locality in the future. And I take this opportunity of thanking the members of the old Volunteer Department, and the citizens in general, for the valuable assistance rendered on these occasions.

NUMBER OF FIRES AND ALARMS DURING THE YEAR.

During the year the Department has answered 86 alarms from all sources ; 62 alarms from boxes ; 15 still alarms ; 9 alarms from telephone ; there being 82 actual fires and 4 false alarms.

CONDITION OF APPARATUS.

The apparatus is all in good order, and has been kept so at all times during the year; it consists of four engines, four two-wheel hose tenders, and one Hayes truck, in active service, and three relief engines and four four-wheel hose carriages, and 6,000 feet of rubber hose. Classified as follows:

IN SERVICE:

Two second-class Amoskeag engines. One fourth-class Amoskeag engine. One third-class Silsby engine. Four two-wheel hose tenders. One Hayes hook and ladder truck.

RELIEF.

One second-class Silsby engine. One third-class Silsby engine. One fourth-class Silsby engine. Four four-wheel hose carriages.

The Common Council, at your request, has entered into a contract with the Hydraulic Company, to erect and keep in order a line of hydrants on Front and First streets, for a period of ten years. This will necessitate the locating of a Hose Company in that locality, and will admit of the removal of one of the engines to the western portion of the city. And I would recommend the selling of the house now occupied by Engine Company No. 3, and the purchasing of a lot and erection of a house in the vicinity of the junction of Washington and B streets, to move that Company to, as an engine in that locality would be a protection to more property than at any other place in the western part of the city, besides being available to be brought to the City Front quickly, if required, by taking either Washington or B street. With this change, and with the force that will be obtained from the Hydraulic Company, I think the Department will be able to cope successfully with any emergency that is likely to arise.

I would also recommend the sale of the property formerly occupied by "Tiger 5" and "Couch 6," as I think when the city extends so as to require the addition of more engines, more desirable locations can be found.

HOSE.

The Department has in service about 6,000 feet of rubber hose, 3,500 feet being good, the balance being in fair condition. I would recommend the purchase of 2,000 feet the coming year.

HORSES.

We have in service in Department sixteen horses, twelve with Engine Companies, two with Truck Company, one with supply wagon, one extra at Engine Company No. 3; during the year two have been condemned as being unserviceable, and sold, and one dying of lung fever.

CISTERN AND HYDRANTS.

There have been built during past year three cisterns, of a capacity of 20,000 gallons each, and one arched and enlarged to above capacity, making total of seventy-two cisterns, with a capacity of 1,244,000 gallons. Also sixteen hydrants, making total of twenty-eight. I would suggest to the Common Council the adoption of a certain style of hydrant, and would recommend the pattern now being used by the Hydraulic Company. It is of the make largely used in New York and Eastern cities, and so constructed as to relieve itself of all surplus water when shut after being used, thereby avoiding the liability of freezing during winter months; also the keeping of a few on hand, so as to be immediately available for use when the Water Company lay new mains; as the expense of cutting the pipe and extra cost attached to erecting same on old mains is more than the entire cost of hydrant. I would also recommend the erection of more hydrants to take the place of cisterns, on all mains of a capacity large enough to supply them, as they can be erected while a main is being laid at a cost not exceeding fifty-five dollars, while a cistern of 20,000 gallons capacity, including connections, costs five hundred and fifty dollars; thereby avoiding the continual expense which necessarily follows in recementing, cleaning out and replacing broken covers.

FIRE ORDINANCES.

The introduction of elevators and hoistways into the wholesale buildings throughout the city, renders it extremely hazardous to life, they being generally situated in the front portion of the buildings, and in case of fire in the upper stories the firemen are liable to fall through them, besides creating an unobstructed draught from cellar to attic. I would recommend that an ordinance be passed requiring them to be securely closed at night by trap doors, and guarded by substantial railings.

AMENDING OF SECTIONS.

I would also recommend that Section 2, of Ordinance 3,034, be amended so as to prescribe a certain thickness for outside or party walls in brick or stone buildings, as in some instances brick walls are erected only four inches in thickness; and to require the walls to be securely anchored to the beams, with iron anchors; buildings have been erected, during past season, that are not only unsafe for the occupants, but dangerous to pedestrians; also to prohibit the use of wooden lintels or stringers under brick or stone walls.

I accordingly call attention to the section I would suggest amending; that Section 2 of above ordinance be amended so as to read as follows: "The outer walls of all brick or stone buildings hereafter to be erected, shall, for a one-story building be not less than eight inches in thickness; for two stories, not less than twelve inches in thickness for first story and eight inches for second story; if more than two stories, the walls of each story shall be at least twelve inches in thickness, except upper story, and that shall be at least eight inches in thickness. And all walls shall be securely anchored, with iron anchors, to each tier of beams, said anchors to be made of $1\frac{1}{2}$ by $\frac{3}{8}$ or $\frac{5}{8}$ wrought iron; said anchor shall be securely built into the wall at least one-half the thickness of the wall, at intervals of not more than eight feet apart, and well fastened to the beams. No brick or stone walls shall be supported upon stringers of wood, in any portion of the city."

I would respectfully call your attention to the report of the Superintendent of the Fire Alarm, especially to the changes suggested in regard to the battery and line circuit, so as to avoid the striking of the bell when any trivial accident occurs.

In conclusion, I tender my sincere thanks to your Honorable Board for the many favors extended to increase the efficiency of the Department, and official courtesy extended to myself and associates, and to W. H. Watkinds, Chief of Police, for willing and efficient aid rendered the Department on all occasions when required, also to Julius Dilg, Superintendent of Fire Alarm.

To my assistants, and to each and every member of the Department, I present my thanks for the faithful manner in which they have performed their duties on all occasions during the year.

Respectfully submitted,

THOS. A. JORDAN.

Chief Engineer Portland Paid Fire Department.